US Army Corps
of Engineers

COMMERCIAL ACTIVITIES

BASELINE STUDY

Engineer
Studies
Center

CEESC-R-91-12

COMMERCIAL ACTIVITIES

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The Commercial Activities (CA) Program is a government-wide effort to ensure that goods and services are acquired in the most economical manner. To ensure continued success and compliance, the U.S. Army Deputy Chief of Engineers directed that a thorough inventory of Corps functions and positions be compiled. The Engineer Studies Center (ESC) was subsequently asked to assist the Corps' Directorate of Resource Management in developing that inventory. ESC surveyed available data sources, designed a methodology, extracted CA inventories, and provided results to DRM. Software was developed (using object oriented programming technology) that automated processing. This report documents that methodology, reviews the candidates and criteria for source data, and provides examples of the output reports.

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Prepared by
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March 1991

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CONTENTS

EXECUTIVE SUMMARY

The Commercial Activities (CA) Program is a government-wide effort to ensure that goods and services are acquired in the most economical manner. The Corps of Engineers has been one of the more successful agencies in realizing the benefits of contracting for commercial-type activities.

To ensure continued success and compliance, the Deputy Chief of Engineers directed a thorough inventory of Corps functions. As a part of that effort, the Engineer Studies Center (ESC) was subsequently asked to assist the Corps Directorate of Resource Management (DRM) in reviewing the classification of Corps positions. ESC surveyed available data sources, designed a methodology, extracted CA inventories, and provided results to DRM. This report documents ESC's methodology and provides examples of the source data and output reports.

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COMMERCIAL ACTIVITIES

BASELINE STUDY

I. INTRODUCTION

1. **PURPOSE.** This report describes the Engineer Studies Center's (ESC) input to the Commercial Activities (CA) Baseline Study, conducted by the U.S. Army Corps of Engineers (USACE), Directorate of Resource Management (DRM).

2. **SCOPE.** In response to a DRM request, ESC developed an objectively based inventory of Corps positions, categorized by CA function.[1] ESC provided the products of the study (estimated CA baselines) to DRM for distribution to the functional managers. This report does not list or discuss that inventory. Rather, it documents the data and methodology ESC developed to create those baselines.

3. **BACKGROUND.**

a. **CA Program Definition.** The CA program is promulgated in the Office of Management and Budget (OMB) Circular A-76, *Performance of Commercial Activities*. Basically it requires that services currently performed within government organizations should be performed under contract if they can be obtained more economically from commercial sources.

(1) ***A-76.*** Although A-76 first appeared in 1966, the theory that government activities should not compete with or usurp the private sector can be traced back to congressional committee investigations in the 1930s and Bureau of the Budget Bulletins in the 1950s. While the desire to limit the government to "government functions" is not new, the 1980s saw an administration that perceived it had a mandate to reduce the size of government; consequently, the CA program was given renewed emphasis.

(2) ***Executive Order No. 12615.*** Executive Order No. 12615 initiated a new phase of the program.[2] Prior to the Executive Order, functions were inventoried within the government. Those found to be commercial were studied, and those that could be done cheaper by the private sector were contracted. The Executive Order changed the ground rules--3 percent of the target population would be studied yearly, and 30 percent of those studied would presumptively be contractible. Cuts would be levied "up front." If actual studies showed cost efficiencies favored in-house functions, the withdrawn spaces would be restored. That presumed, however, that studies occurred, and that 3 percent of the target population was studied. Whereas agencies had previously temporized, now there were compelling reasons to do studies.

b. **Corps Compliance with CA Program.** The Corps of Engineers has, compared to most other government agencies (Defense and others), complied with the CA program. Recently, however, the Corps studiable population under the CA program has dramatically changed.

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[1] "Study of Functions Exempted, Excluded, or Excepted from the Commercial Activities Program," Memorandum from John Wallace, Director of Resource Management, to Commander and Director, ESC, 30 June 1989.

[2] "Performance of Commercial Activities," Executive Order No. 12615, 19 November 1987.

(1) ***Reduction of Studiable Population.*** In 1987, Corps activities reported the civil works (CW) population to be 28,195, with 8,500 studiable. Although the population in 1988 was 27,692, studiables fell to 4,714. This reduction of studiable population (over 40 percent) was not the result of completed studies, but because more positions were excluded from CA study. A smaller studiable population means fewer studies; fewer studies mean fewer cases where contracting is indicated. OMB's cuts are rebuttable; however, rebuttals would require evidence, namely, completed studies.

(2) ***Corps CA Reports to DRM.*** Unfortunately, the format for Corps CA reports to DRM does not indicate what positions were reclassified. MG Kem, Deputy Chief of Engineers, instructed DRM to resolve the population shift to either refute Corps submissions or justify the estimates to OMB. As part of its investigation, DRM asked ESC to help verify the baseline functional estimates. In November of 1989, ESC began the work which is the subject of this report.

4. **ESSENTIAL ELEMENTS OF ANALYSIS.** ESC's role in DRM's CA Baseline Study was to analyze the declining studiable population as revealed by 1987 and 1988 field agencies' submissions. ESC's effort was clearly delimited. ESC should:

- develop an objective means to categorize Corps positions, using available information sources, and compare to CA data submitted to DRM. There would be no attempt to create a new database or to issue a new data call to field organizations.

- consider both civil- and military-funded positions, although the impetus for the study came from the civil-funded inventory.

- not sample FOAs to check the accuracy of their submissions.

- not review the rationale of function categories (excluded, exempted, and excepted functions) as defined in ER 5-1-3, Appendix B.

5. **METHODOLOGY.** This section presents the key elements of the problem as they relate to ESC's methodology.

a. **CA Structure.** The intention of the CA program was briefly described above. As a government-wide program, its implementation involves many issues. ESC's effort had to be within the existing framework.

(1) ***Regulations.*** A series of regulations and orders governs the CA program.[3] Together they dictate the scope and procedures of CA studies. ESC was concerned only with the scope; this indicates which activities are considered to be commercially viable; i.e., potentially contractible. There are also governmental activities (referred to as stand alone and excluded) which have no private sector counterpart. Other areas (termed general functional areas and

[3]See implementing regulations: *Management Commercial Activities Program*, Army Regulation (AR) 5-20 (Department of the Army [DA], 20 October 1986), and *Management Commercial Activities Program*, Engineer Regulation (ER) 5-1-3 (USACE, 1 December 1987).

discussed below) are candidates for contract, but even some of those may have dispensations of various forms. CA procedure refers to the cost/benefit analysis to which a function is subjected: how positions are quantified, solicitations prepared, costing defined, bids compared, questions resolved, and decisions made.

(2) ***General Functional Areas (GFA).*** AR 5-20 and ER 5-1-3 contain listings of GFAs that apply to the Army and the Corps respectively. DRM has augmented the GFAs with a special list of "governmental" areas that provides an identifiable GFA for each space.[4] The term "GFA" is used throughout this report to encompass that "superset" of functional areas. (See Section 10.b for a discussion of GFA impact on baseline inventories.) There are over 200 GFAs applicable to Corps activities. Some can be found in any organization; e.g., GFA S709 is for custodial services. Others are peculiar to the Corps - C112 is for Operations and Maintenance of Dams, and M027 for Engineering Management. GFA assignment is the crux of establishing the baseline. If DRM had an accurate and credible GFA breakout for each FOA, ESC's intervention would have been unnecessary.

b. **Source Data.** ESC's ability to develop an alternative inventory was predicated on finding data which would support an objective approach. ESC envisioned a rule-based methodology. This would take a position (whether full time equivalent [FTE] or manpower space), look at various characteristics of that position (organization, occupational series, etc.), and assign the position a GFA that most reasonably characterizes its function. Within the Corps, there were several possible sources of data that might satisfy ESC's needs.

(1) ***Force Configuration File (FORCON).*** The Directorate of Civil Works (DCW) uses FORCON to translate funding into manyears. It addresses, however, only civil spaces. Since the CA program applies to both military and civil manyears, ESC sought a database which included both funding types. FORCON tended to change from year to year, frustrating ESC's ability to apply the same rules to several years worth of data. Above all else, however, FORCON's database did not provide enough information to construct a set of rules.

(2) ***DRM's Inventory.*** The database DRM compiled from FOA submissions was never considered. A good part of the CA problem could be attributed to the absence of a data base that would permit an audit trail of CA categories back to contributing FOA spaces. The inventory was the very item against which ESC's alternative scheme was to be compared.

c. **XF7 File.** The Corps of Engineers Management Information System for Personnel Administration (COEMIS PA) is the Corps-wide automated personnel system.[5] It covers and supports all local civilian personnel management, both civil- and military-funded positions. Because it is the file that Personnel uses to manage activities from day-to-day, there is an imperative to keep it accurate and up-to-date. It also contains full organizational and functional information that ESC would necessarily rely on to construct its functional mapping. For these reasons, ESC determined that COEMIS PA was the only database from which a CA baseline inventory could reasonably be generated. The file ESC actually used is an extract (referred to as an XF7) that is downloaded to tape monthly by the Engineer Automation Support Activity

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[4] "FY 1989 Commercial Activity Inventory/Schedule," Memorandum from Directorate of Resource Management to Field Operating Activities (FOA), November 1989.

[5] "Personnel Information Systems Corps of Engineers Management Information System for Personnel Administration," Engineer Pamphlet 680-1-1 (USACE, 1 June 1987).

(EASA) and retained for 5 years. Many data elements of the XF7 are of no practical value to ESC's needs. Therefore, ESC directed EASA to cull a subset of elements when generating copies for analysis. **Figure 1** depicts the data elements comprising the XF7-extract.

COEMIS PA DATA ELEMENT	COEMIS ID
Organization Code	22E
Pay Plan	16A
Grade	18A
Function Designator	36A
Work Schedule	32A
Organization Name	22B
Occupational Series	17A
Functional Class	48A
Army Mgmt Structure Code	36B
Supervisory Position	51A
Position Occupied	34A
Career Program	41A
Command Code	68A
FA Organization Code	94B
Corps Stratification	15D
Pay Basis	21A
FTE Function Code	36C
Budget Element	N/A
Position Title	N/A

Figure 1. TABLE OF XF7-EXTRACT DATA ELEMENTS

6. **APPROACH.** **Figure 2** shows the approach proposed to DRM--the creation of an alternative baseline CA inventory from the COEMIS PA. Because the COEMIS PA is a non-CA source data (non-CA meaning that the GFA assignments were not predetermined, i.e., positions had precoded GFAs that would frustrate a clear audit trail), creation of an alternative baseline CA inventory depended upon marrying COEMIS data with ESC's assignment rules. The initial intent was to create an objectively derived, alternative baseline that could be compared to the inventories compiled from FOA submissions. By using the COEMIS XF7 file ESC could, if necessary, look at any month over the last 5 years. This advantage permits seasonal or year-to-year changes to be factored into the analysis.

a. **Decision Rules.** During preliminary meetings with DRM, ESC emphasized that building a credible baseline depended upon how much information could be inferred from the XF7 entries. ESC would apply a series of rules to each entry in the file to assign that position to a GFA. This "mapping" of XF7 into GFA depended upon the variability in the XF7. No single data element was sufficient to make all assignments. The First Level Organization (FLO) code could support some assignments. Those with **FLO = 'E'** (public affairs) could be assigned to GFA M015. But it was insufficient to select one of the many potential GFAs for a position in

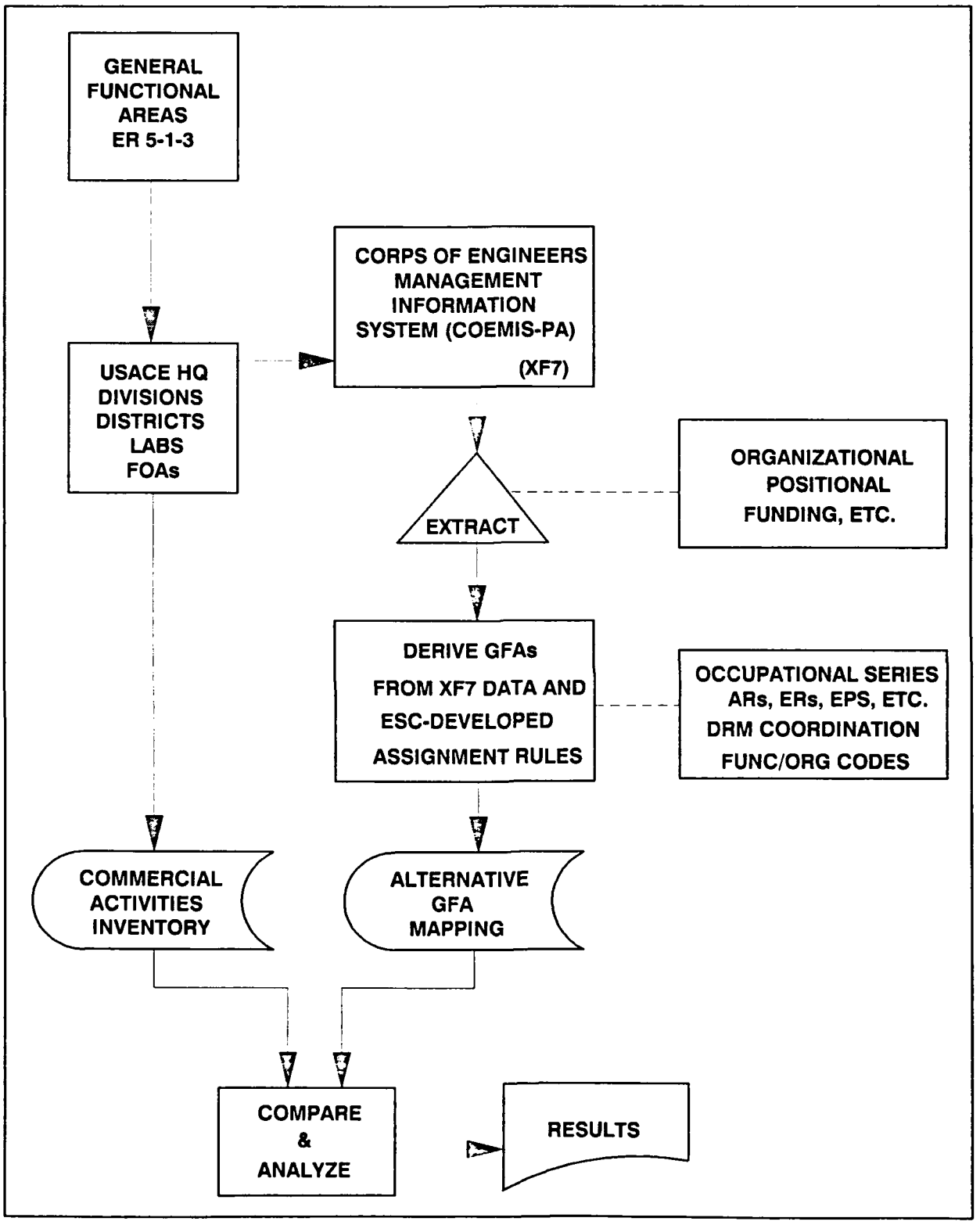

Figure 2. ESC'S APPROACH TO ANALYZING CA DIFFERENCES

operations (**FLO = 'R'**). The 15 defined FLO codes could not support assignments to over 200 candidate GFAs. Keying on data elements that have a large number of admissible entries creates possibilities, but also may not be the entire answer. There are hundreds of different occupational-series in the Corps, but one series--civil engineers (GS 0810)--is found in 9,000 Corps positions. Since there is not an exclusive GFA for civil engineers, there must be a way to assign them to a GFA that corresponds to their actual duties. It must be remembered, however, that COEMIS PA data were not designed to support the CA program. For ESC to succeed, the study team had to comprehend the data and be able to construct a mapping. The team considered it a two-phased process:

(1) ***Phase I.*** The first step in developing the method was to fully explore the XF7 and its elements. A newly obtained data file should always be viewed with some trepidation. Is it in the expected format? Does it contain the data elements requested? Does it contain all the records of interest? Are the documented (legal) values of data elements the only ones used? These are not idle questions. In this action, the answer to every question was an emphatic No. For that reason, ESC spent as much time obtaining the data and puzzling through anomalies as in actually preparing the final methodology (data and program coding).

(2) ***Phase II.*** In practice, systems analysis and software development are interdependent. ESC did not routinely review the XF7 without considering how a data element could be used, alone or in conjunction with other elements, and whether it would facilitate GFA assignments.

(a) *Program Logic.* As mentioned before, "rules" would be applied to the data elements on the XF7 to determine appropriate GFA assignments. These "rules"--in reality a combination of computer program and data--might also be viewed as a form of decision table. ESC created data element files in which were coded data element-GFA combinations.[6] Logic in the program was added or changed which would examine a data element, check the appropriate file/table for a match and, if indicated, make an assignment. The logic can be viewed as a decision hierarchy. There are three general steps: first, a position record is read from the XF7 file; second, checks are then made to assure that the position is in the target population; and third, GFA assignment is attempted according to the presence or absence of specific instances of data elements.

(b) *Assignment.* Assignment logic examines elements in the following order: occupational series, organization, corps stratification function, and first-line organization code. The first "rule" that is satisfied determines the GFA assignment; succeeding "rules" are not checked. For some GFAs, supervisory status may also influence assignments. If no GFA is nominated, the position is not assigned a code, nor is it counted in the CA results. **Figure 3** portrays the process.

b. **Report Descriptions.** ESC developed reports for the study designed to be used as working papers and compared across organizations. Part of the problem that led to the Baseline Study was that the field input information was too aggregated, and there was no audit trail depicting what went into a particular GFA. No single format was sufficient; ESC's working

[6] These files are documented in Annex A.

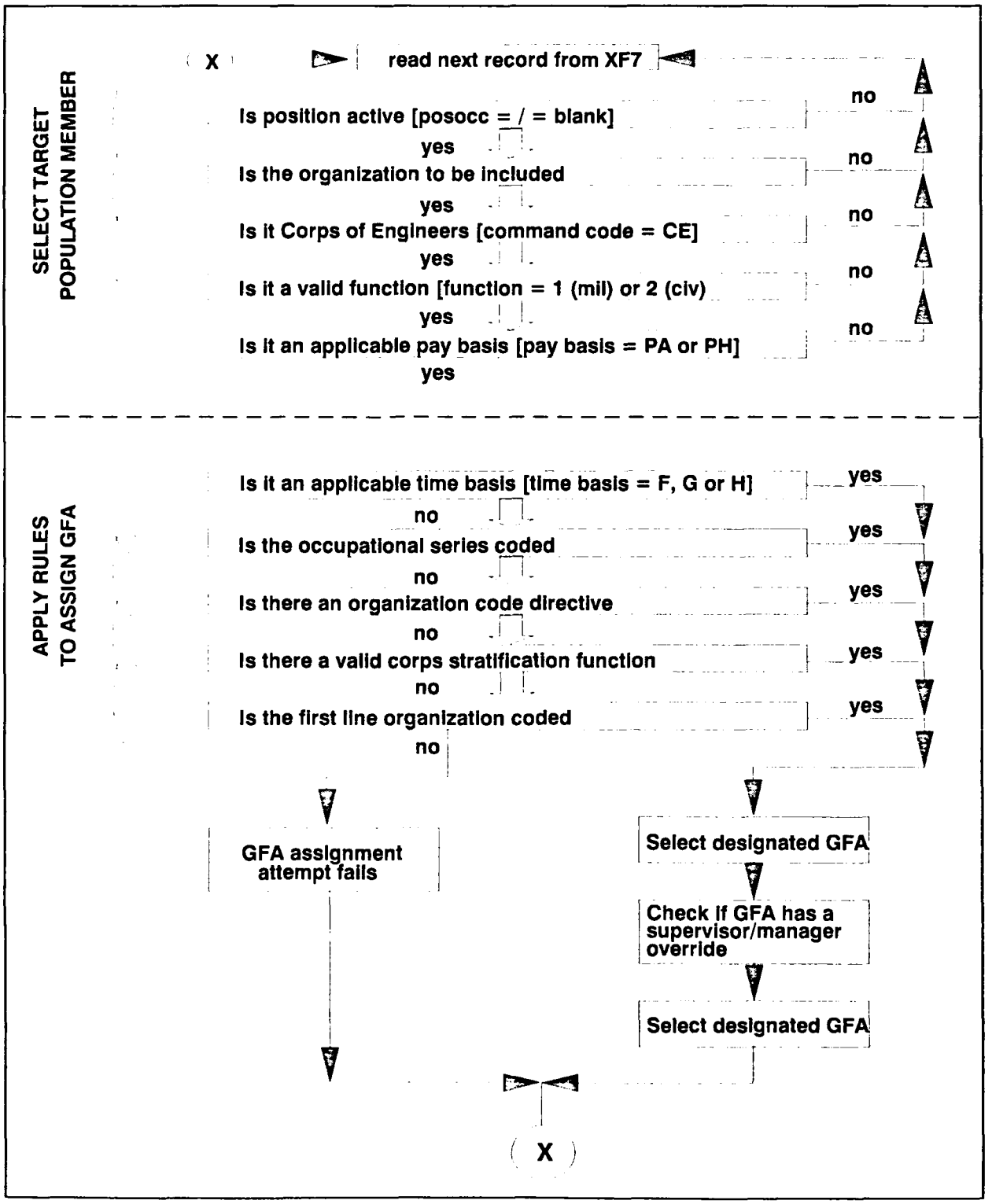

Figure 3. XF7-GFA ASSIGNMENT LOGIC

reports focused on GFAs, CA categories, and funding. Several reports were defined, and the level of organizational and functional detail could be varied. ***FOA-GFA.*** This report lists GFA assignments for individual Districts, Divisions, and FOAs, Division rollups (division plus district offices), and USACE totals. There are actually two instances of GFAs--a 4-character GFA, and a 5-character sub-GFA. The format of a GFA is an alphabetic prefix followed by 3 digits. Sub-GFAs have an alphabetic suffix to identify subfunctions of the parent GFA.[7] The user can set a switch to indicate whether sub-GFAs should be printed or rolled up to the 4-character parent level. **Figure 4** shows the 4-character level report.

(1) ***Division Summaries.*** ESC designed this report (**Figure 5**) to enable total division population categories to be easily compared and to quickly reveal if the candidate population derived from the XF7 falls within an acceptable range of DRM's inventory. One caution regarding this report: the USACE entry does not represent only the sum of the divisions included. The entry also includes laboratories and other FOAs which were admissible according to the FOA file, and to the extent that they were represented on the XF7 version used.[8]

(2) ***FORCON.*** The Deputy Chief of Engineers asked that ESC reduce the complexity of the FOA-GFA report to facilitate comparisons. While there were many ways this could have been done, ESC and DRM decided that by mapping the GFAs into FORCON functional groupings (**Figure 6**), several things would be achieved. First, the numbers would be highly aggregated as the Deputy requested. Second, it might enable the XF7-derived baseline to be more easily compared to both DRM's inventory and the Civil Works' FORCON. (DCW had in fact asked DRM if FORCON categories were not more descriptive than the GFAs. To calibrate the two profiles, DCW had provided DRM with a list showing which GFAs were equivalent to which FORCON categories. ESC used the mapping from that list.[9])

[7] For example, GFA S716, motor vehicle operation, and S716E, heavy truck operation.
[8] It would include all legal organizations as identified in the Organization File (see Appendix A-5).
[9] See Annex A for GFA/FORCON mapping.

* * * * USACE ROLLUP

GENERAL FUNCTIONAL AREAS		CIVIL FUNDED ACTIVITIES					MILITARY FUNDED ACTIVITIES					TOTAL
		Government		Commercial			Government		Commercial			
		Stdaln	Exclu	Study	Excpt	Exmpt	Stdaln	Exclu	Study	Excpt	Exmpt	
C100	Opn & Maint of flood	0	0	0	0	0	0	0	0	0	0	0
C106	Opns of Recreational	0	0	2132	0	0	0	0	0	0	0	2132
C108	Opns of USACE Floati	0	0	908	0	0	0	0	7	0	0	915
C109	Fish & Hatcheries	0	0	0	0	0	0	0	0	0	0	0
C110	Maint & repair of US	0	0	103	0	0	0	0	1	0	0	104
C111	Bank Stabilization	0	0	472	0	0	0	0	0	0	0	472
C112	Opn & Maint of Dams	0	1	1876	0	0	0	0	4	0	0	1881
C113	Studies Supporting R	0	0	182	0	0	0	0	1	0	0	183
C114	Natural Resource Man	0	0	67	0	0	0	0	32	0	0	99
C115	Opns & Maint of Lock	0	0	168	1	0	0	0	5	0	0	174
C116	Opn & Maint (Open wa	0	0	1063	0	0	0	0	24	0	0	1087
C117	Opns & Maint of jett	0	0	329	0	0	0	0	0	0	0	329
C118	Opns & Maint of Hydr	0	735	269	0	0	0	4	0	0	0	1008
C119	Opn & Maint of the W	0	60	113	0	0	0	0	0	0	0	173
C120	Designs, plans, spec	0	0	0	998	0	0	0	0	379	0	1377
C121	Non A-E Professional	0	0	0	0	0	0	0	0	0	0	0
C122	Tech review of In-ho	0	0	0	2187	0	0	0	0	1218	0	3405
C123	Hydraulic & hydrolo	0	0	89	0	0	0	0	23	0	0	112
C124	Subsurface explorati	0	0	42	0	0	0	0	19	0	0	61
C125	Surveying & mapping	0	0	687	0	0	0	0	118	0	0	805
C126	Drafting Services (D	0	0	138	0	0	0	0	124	0	0	262
C127	Laboratory Materials	0	0	0	0	0	0	0	0	0	0	0
C128	Other Professional A	0	0	486	0	0	0	0	617	0	0	1103
C200	Real Estate Acquisit	0	0	193	0	0	0	0	159	0	0	352
C201	Employee Relocation	0	0	0	0	0	0	0	0	0	0	0
C202	Real Estate Appraisa	0	0	70	0	0	0	0	51	0	0	121
C999	Other	0	0	0	0	0	0	0	0	0	0	0
H115	Clinics & Dispensari	0	0	27	0	0	0	0	10	0	0	37
J507	Electronic & Communi	0	0	0	0	0	0	0	0	0	0	0
J999	Other Equipment	0	0	0	0	0	0	0	0	0	0	0
M001	Management of the Co	0	857	0	0	0	0	1023	0	0	0	1880
M002	Management of the Op	1555	0	0	0	0	995	0	0	0	0	2550
M003	Real Estate Division	317	0	0	0	0	231	0	0	0	0	548
M004	Resource Management/	350	0	0	0	0	201	0	0	0	0	551
M005	Program Development	0	316	0	0	0	0	83	0	0	0	399
M006	Management of R & D	6	0	0	0	0	11	0	0	0	0	17
M007	Installation Service	252	0	0	0	0	93	0	0	0	0	345
M008	Planning	2488	0	0	0	0	1040	0	0	0	0	3528
M009	Counsel/Legal	234	0	0	0	0	124	0	0	0	0	358
M010	Contracting	0	505	0	0	0	0	402	0	0	0	907
M011	Visual Information M	0	0	0	0	0	0	0	0	0	0	0

Figure 4. FIELD OPERATING ACTIVITY GENERAL FUNCTIONAL AREA (FOA GFA) REPORT (4-CHARACTER LEVEL)

**** USACE ROLLUP

GENERAL FUNCTIONAL AREAS		CIVIL FUNDED ACTIVITIES					MILITARY FUNDED ACTIVITIES					TOTAL
		Government		Commercial			Government		Commercial			
		Stdaln	Exclu	Study	Excpt	Exmpt	Stdaln	Exclu	Study	Excpt	Exmpt	
M012	Education & training	63	0	0	0	0	49	0	0	0	0	112
M013	Management of ADP Fu	60	0	0	0	0	43	0	0	0	0	103
M014	Management of RPMA	0	0	0	0	0	0	0	0	0	0	0
M015	Public Affairs	133	0	0	0	0	50	0	0	0	0	183
M016	Managment of Personn	515	0	0	0	0	206	0	0	0	0	721
M017	Inspector General Ma	3	0	0	0	0	0	0	0	0	0	3
M018	Internal Review & Au	108	0	0	0	0	23	0	0	0	0	131
M019	Command Staff	125	0	0	0	0	35	0	0	0	0	160
M020	Safety & Occupationa	72	0	0	0	0	40	0	0	0	0	112
M021	Dredging Managment	188	0	0	0	0	3	0	0	0	0	191
M022	Studies Management	0	0	0	0	0	0	0	0	0	0	0
M023	WRSC Management	1	0	0	0	0	0	0	0	0	0	1
M024	Logistics Management	333	0	0	0	0	156	0	0	0	0	489
M025	Security & Law Enfor	51	0	0	0	0	18	0	0	0	0	69
M026	Emergency Management	155	0	0	0	0	6	0	0	0	0	161
M027	Management of the En	0	218	0	0	0	0	221	0	0	0	439
M028	Project Management	0	386	0	0	0	0	676	0	0	0	1062
R660	RDT&E Support	0	0	0	0	0	0	0	0	0	0	0
S700	Natural Resource Ser	0	0	0	0	0	0	0	0	0	0	0
S701	Advertising & Public	0	0	0	0	0	0	0	0	0	0	0
S702	Financial & Payroll	0	0	837	0	0	0	0	444	0	0	1281
S703	Debt Collection	0	0	0	0	0	0	0	0	0	0	0
S709	Custodial Services	0	0	135	0	0	0	0	50	0	0	185
S710	Pest Management	0	0	4	0	0	0	0	7	0	0	11
S712	Refuse Collection &	0	0	0	0	0	0	0	0	0	0	0
S713	Food Services	0	0	74	0	0	0	0	0	0	0	74
S714	Furniture	0	0	0	0	0	0	0	0	0	0	0
S715	Office Equipment	0	0	0	0	0	0	0	0	0	0	0
S716	Motor Vehicle Opn	0	0	473	0	0	0	0	91	0	0	564
S717	Motor Vehicle Maint	0	0	39	0	0	0	0	7	0	0	46
S718	Fire Prevention	0	0	0	0	0	0	0	0	0	0	0
S724	Guard Services	0	0	1	0	0	0	0	13	0	0	14
S725	Electrical Plants &	0	0	0	0	0	0	0	0	0	0	0
S726	Heating Plants & Sys	0	0	15	0	0	0	0	20	0	0	35
S727	Water Plants & Syste	0	0	36	0	0	0	0	0	0	0	36
S728	Sewage & Waste Plant	0	0	8	0	0	0	0	0	0	0	8
S729	Air Conditioning & R	0	0	0	0	0	0	0	0	0	0	0
S730	Other Utilities	0	0	7	0	0	0	0	3	0	0	10
S732	Warehousing & Distri	0	0	0	0	0	0	0	0	0	0	0
S999	Other Installation/F	0	0	20	0	0	0	0	1	0	0	21
T801	Storage & Warehousin	0	0	0	0	0	0	0	0	0	0	0

Figure 4. FIELD OPERATING ACTIVITY GENERAL FUNCTIONAL AREA (FOA GFA) REPORT (4-CHARACTER LEVEL) -- CONTINUED

* * * * USACE ROLLUP

GENERAL FUNCTIONAL AREAS		CIVIL FUNDED ACTIVITIES					MILITARY FUNDED ACTIVITIES					TOTAL
		Government		Commercial			Government		Commercial			
		Stdaln	Exclu	Study	Excpt	Exmpt	Stdaln	Exclu	Study	Excpt	Exmpt	
T805	Opn of bulk liquid s	0	0	0	0	0	0	0	0	0	0	0
T806	Printing & reproduct	0	0	165	0	0	0	0	89	0	0	254
T807	Visual Information S	0	0	131	0	0	0	0	64	0	0	195
T809	Administrative Telep	0	0	0	0	0	0	0	0	0	0	0
T810	Air Transportation S	0	0	0	0	0	0	0	0	0	0	0
T811	Water Transportation	0	0	0	0	0	0	0	0	0	0	0
T816	Telecommunication Ce	0	0	0	0	0	0	0	0	0	0	0
T817	Other communications	0	0	0	0	0	0	0	0	0	0	0
T819	Preparation & dispos	0	0	0	0	0	0	0	0	0	0	0
T820	Administrative Suppo	0	0	2735	0	73	0	0	1475	0	52	4335
T999	Other non-manufactur	0	0	0	0	0	0	0	0	0	0	0
U300	Specialized skill tr	0	0	15	0	0	0	0	3	0	0	18
U500	Professional Develop	0	0	203	0	0	0	0	63	0	0	266
W824	Data Processing Serv	0	0	194	0	0	0	0	113	0	0	307
W825	Maint of ADP Equip	0	0	0	0	0	0	0	0	0	0	0
W826	Systems Design, Deve	0	0	486	0	0	0	0	363	0	0	849
W827	Software Services fo	0	0	0	0	0	0	0	0	0	0	0
W999	Other ADP Functions	0	0	0	0	0	0	0	0	0	0	0
X937	Logging & Lumber	0	0	0	0	0	0	0	0	0	0	0
X939	Construction product	0	0	0	0	0	0	0	0	0	0	0
X999	Other products	0	0	0	0	0	0	0	0	0	0	0
Z991	Family Housing	0	0	0	0	0	0	0	0	0	0	0
Z992	Family Housing	0	0	46	0	0	0	0	18	0	0	64
Z993	Grounds & Surface Ar	0	0	5	0	0	0	0	16	0	0	21
Z997	Railroad Facilties	0	0	0	0	0	0	0	0	0	0	0
Z998	Waterways & Waterfro	0	0	0	0	0	0	0	0	0	0	0

Summary Totals: USACE ROLLUP

CATEGORY	CIVIL	MILITARY
Gov't Functions	7009	3324
Excluded	3078	2409
Commercial Activ	15043	4035
Exempted	3186	1597
Excepted	73	52
Totals	28389 (71.32%)	11417 (28.68%)

Overall Total: 39806

Figure 4. FIELD OPERATING ACTIVITY GENERAL FUNCTIONAL AREA (FOA GFA) REPORT (4-CHARACTER LEVEL) -- CONTINUED

* * * * USACE ROLLUP

ORGANIZATION	Government		Commercial			TOTAL
	Stdaln	Exclu	Study	Excpt	Exmpt	
CIVIL FUNDED ACTIVITIES						
USACE	7009	3078	15043	3186	73	28389
LMVD	897	477	3204	638	11	5227
MRD	344	191	920	218	2	1675
NAD	479	231	948	137	3	1798
NED	236	25	225	43	2	531
NCD	595	211	1717	386	8	2917
NPD	652	475	1320	351	3	2801
ORD	655	344	2359	386	10	3754
SAD	757	426	1675	302	6	3166
SPD	446	151	652	350	4	1603
SWD	628	393	1801	360	4	3186
MILITARY FUNDED ACTIVITIES						
USACE	3324	2409	4035	1597	52	11417
LMVD	15	1	9	9	0	34
MRD	145	268	587	292	2	1294
NAD	173	506	532	194	5	1410
NED	50	5	32	5	0	92
NCD	8	0	2	12	0	22
NPD	119	236	197	97	3	652
ORD	84	123	208	102	0	517
SAD	141	246	565	182	5	1139
SPD	108	347	380	245	4	1084
SWD	161	305	408	238	3	1115

Figure 5. DIVISION SUMMARIES REPORT

CA BREAKOUT FOR USACE

Item	CW-Tot	Stdaln	Exclu	CW GF	CA	Excpt	Exmpt	CW-CA
ADM	8672	2300	505	2805	5794	0	73	5867
PLN	2488	2488	0	2488	0	0	0	0
ENG	4707	0	218	218	1304	3185	0	4489
CNT	857	0	857	857	0	0	0	0
OPS	3649	343	736	1079	7569	1	0	7570
DRD	1199	188	0	188	1011	0	0	1011
RVT	472	0	0	0	472	0	0	472
FC	1877	0	1	1	1876	0	0	1876
GRF	182	0	0	0	182	0	0	182
PWR	1004	0	735	735	269	0	0	269
NRM	2199	0	0	0	2199	0	0	2199
EM	155	155	0	155	0	0	0	0
NAV	1561	0	0	0	1560	1	0	1561
RE	580	317	0	317	263	0	0	263
RD	6	6	0	6	0	0	0	0
RSH	6	6	0	6	0	0	0	0
SPT	0	0	0	0	0	0	0	0
TEC	2430	1555	762	2317	113	0	0	113
TOTAL	28389	7009	3078	10087	15043	3186	73	18302

Figure 6. FORCON MAPPING REPORT

II. COMPUTATIONAL ENVIRONMENT

7. **COMPUTER CAPACITY.** The data files were too large to allow development on ESC's current IBM AT-compatible microcomputers. Fortunately, ESC was able to pursue development on a PR1ME 6250 belonging to the Belvoir Research, Development, and Engineering Center. The 6250 falls in the category of super-minicomputer. It is a large machine (8 megabytes of RAM, over 600 megabytes of disk storage, 9-track tape capability). The large storage capacity and processing speed of the 6250 greatly accelerated both development and production times.

8. **SOFTWARE.** ESC used all the software tools one would expect to find on a machine the size of the PR1ME--editors, tape handlers, compilers, sort/merge routines, and communications/network software. The program was written in SIMULA.[10] This is a powerful general purpose language and the nestor of object oriented programming. SIMULA is particularly well suited for developing prototype programs, such as ESC developed for CA. It enables developers to add or change features without incurring unreasonable reprogramming.

[10] Lamprecht, Gunther, *Introduction to SIMULA 67* (Friedr. Vieweg & Sohn, Braunschweig/Weisbaden, 1983).

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III. RESULTS AND FINAL OBSERVATIONS

9. **RESULTS.** ESC produced and gave to DRM a CA baseline inventory in June 1990.[11] The original objective (**see Figure 2**) of comparison had given way to the need for a representative inventory that could be used to open dialogues with Divisions and FOAs. Although the intent of this document is to record ESC's methodology, a few aspects of the results deserve some mention.

a. **USACE Totals.** DRM received only a partial response to its November 1989 call to FOAs for revised CA submissions to be used in creating a new baseline inventory. Thus, in July 1990 the Deputy Chief of Engineers considered using ESC's numbers as the basis for opening discussions with FOAs and Divisions regarding their CA populations and inventories. (Interestingly, OMB has estimated the Corps civil-funded studiable population to be between 14,000 and 16,000--ESC's calculation was 15,043.)

b. **FORCON, DRM, ESC Comparison.** The initial study intent, envisioning comparisons leading first to discussions and then to data refinement, did not occur. Near the end of its involvement, ESC participated with CW and DRM in attempts to compare figures, but conditions prevented any resolution. FORCON did not have the specificity; it provided a familiar functional breakout but was too aggregated for comparison to the more detailed GFAs. DRM's efforts had been frustrated by delays in getting data from functional managers. By default, the COEMIS-based estimates became the bench mark and not the check.

c. **Drops.** Figure 3 showed how each entry on the XF7 was tested to assure that it was in the target population. Even when in the "zone," it is conceivable that no GFA assignment might be possible. The XF7-CA program records what may have been the critical reason why a record is ignored and how many met that test but could not be assigned. **Figure 7** gives an example of this processing information from an actual execution. The file contained 56,316 records. Over 16,000 were rejected from consideration. Of those in the "zone," 200 could not be assigned a GFA, leaving a total of 39,806 which were actually in the final tally.

XF7 RECORD DISPOSITION	COUNTS
records read	56,316
vacancies	9,697
organization-related rejects	3,330
non-Corps	64
funding rejects	0
pay rejects	28
job scheduled rejects	3,191
GFA assignment failures	200
assigned population = >	39,806

Figure 7. XF7-CA PROCESSING SUMMARY (APRIL 89)

[11] "FY 1989 Commercial Activity Inventory/Schedule," provided to MG Kem by DRM, July 1990.

d. **Population Shifts.** As previously mentioned, the shift in studiable population in 1987-88 was the reason for ESC's initial involvement. While this issue was later subsumed by the need to find a meaningful "baseline," ESC did look at several past years of COEMIS data to compare results using its XF7-CA characterization. The results are shown in **Figure 8.**[12] ESC's methodology showed no distinguishable differences among the numbers of positions in each category over the 3-year period. Possibly, ESC's XF7-GFA method was insensitive to changes reducing the studiable population. It appears implausible, however, that the observed 50-percent decline could have occurred without some accompanying change in the organization and position structure of the Corps.

e. **Workload/Location Qualifiers.** ESC could not glean all CA-pertinent attributes from COEMIS. Whether a person operated a dam or a lock (the same occupational series applies), or whether a waterway was critical or non-critical (based on tons or shipping) are examples of key CA considerations which a personnel database cannot provide.

10. **OBSERVATIONS.** Typically, a study will conclude or recommend. The products of ESC's CA Baseline study were a methodology (embodied in a computer program and supporting data element files) and a baseline inventory derived from applying that methodology to a recent XF7 file.

a. **A Start.** An XF7-CA baseline inventory is not a permanent solution. Districts, Divisions, and FOAs ultimately must be responsible for compiling accurate CA profiles of their personnel. The procedures, however, should be more certain, and more precise standards used. Functions should be better considered. Results should permit aggregation, but not at the expense of losing an audit trail to the contributing GFAs. The inability to check submissions forecloses any consideration of consistency across FOAs. Objectivity, specificity, and consistency must be achieved.

b. **Functional Taxonomy.** The single most frustrating aspect of the Corps CA problem was the GFAs. Because they are of uncertain or inherited origin, they hinder rather than help the CA program. Suffice it to say, the structure is not Linnaean. A cursory review of the list of GFAs might suggest adequate coverage of Corps functions. Only when correlation of that list is attempted with other Corps taxonomies (organizational structure,[13] Corps Stratification, FORCON, etc.) does its unevenness emerge. There are two GFAs for fish-related functions--C109 and C114A. There is one GFA for technical review (C121), an important Corps function involving thousands of employees. Also, where does the important Corps regulatory authority fall? C113 mentions only regulatory studies. Because the functions defined in ER 5-1-3 did not account for all activities, DRM had to define the M-Codes. This provided some relief, but did not cure the problem. A revised set of GFAs, whose definitions were well considered and coordinated among functional managers, could remove much of the guesswork currently found in the system.

c. **A CA Database?** DRM currently has a CA database. It is, however, only a list of studiable commercial activity spaces and the CA study program. ER 5-1-3 does allude to a

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[12] NB: A 1988 version of the XF7 was missing several entire divisions. Because the distributions for 86, 87, and 89 were almost identical, ESC inferred that a good version of the XF7 88 would contain numbers that follow the same pattern.

[13] "Organization and Function, Divisions and Districts," ER 10-1-3 (USACE, 28 November 1986).

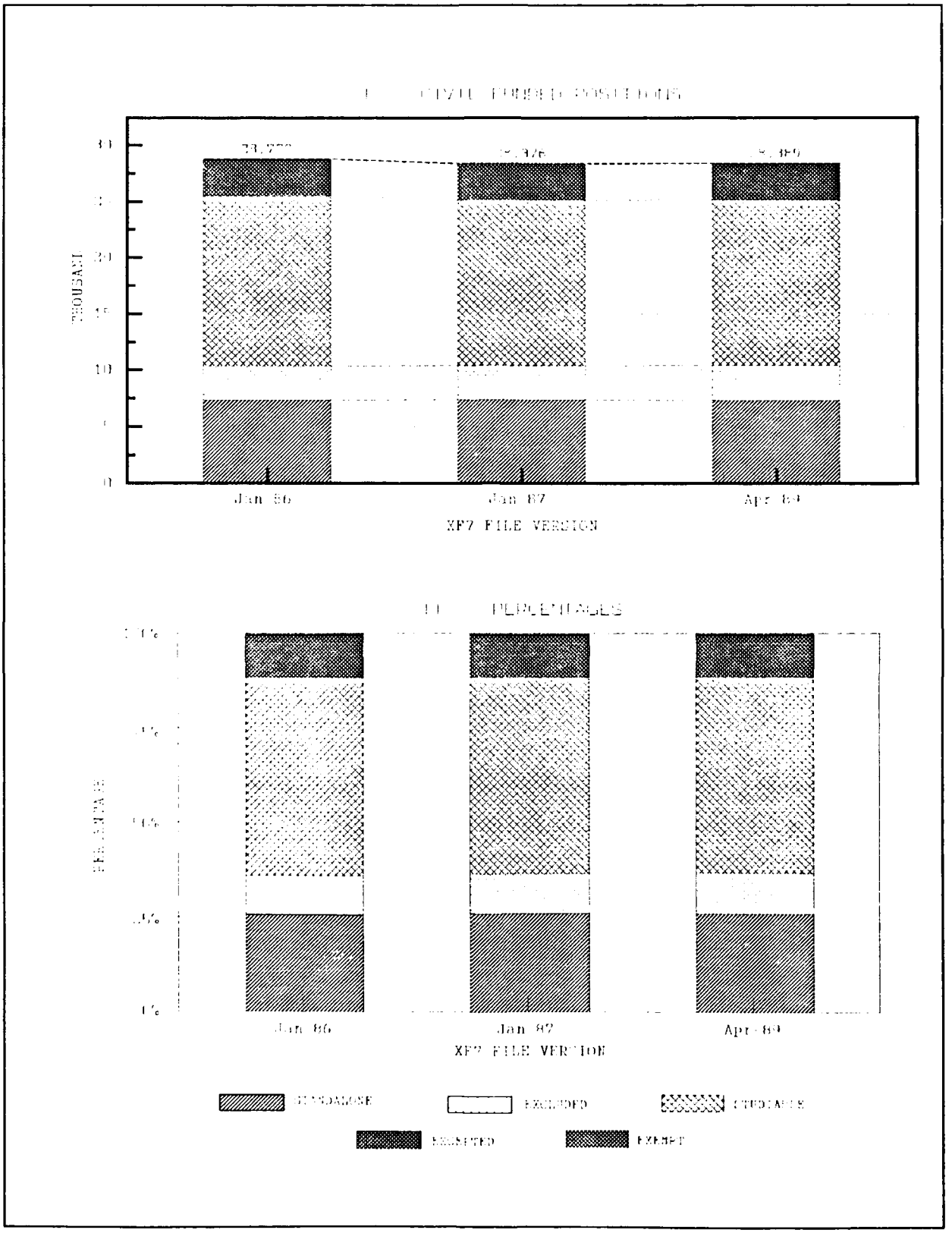

Figure 8. COMMERCIAL ACTIVITIES CATEGORIES (CIVIL-FUNDED POSITIONS)

USACE Commercial Activity Inventory, but its definition has never been attempted. ESC foresees great advantage in having field organization record position and GFA data in the same database. The XF7-CA program demonstrates that this is feasible, but its method of inferring GFA cannot be preferred over local assignments. There is even slack in the COEMIS-PA records which would accommodate such a code and would not burden organizations with yet another report (if that is the intent of ER 5-1-3, Appendix G).

d. **FTE vs Positions**. Some ambiguity surrounds the basic CA specie. The COEMIS database (and therefore the XF7-CA method) covers positions. FORCON deals with FTE workyears. CA studies are of FTEs, but contracting decisions result in position changes. ESC's methodology looked at positions that were coded as permanent, whether full-time or part-time.

e. **Organizational Culture**. A-76 is not a popular regulation within the federal bureaucracy--including the Corps. The Corps, however, has complied with it well enough through the years to be considered one of the government's success stories.[14] It is not hard to imagine that there are situations where a government agency might be willing to eliminate marginal functions. But, after peripheral functions have been studied, the core functions necessarily come under scrutiny. Has CA attention come close enough to those core functions to push some FOAs or functional managers into trying to shield activities they previously thought were safe?

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[14] Lynch, Edward, "Privatization Standoff," *Government Executive* (December 1989), p. 18.

ANNEX A

CA BASELINE STUDY DATA FILE DESCRIPTIONS

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ANNEX A

CA BASELINE STUDY DATA FILE DESCRIPTIONS

1. **PURPOSE.** Annex A documents the input data used to create the Engineer Studies Center's (ESC) Commercial Activities (CA) baseline.

2. **SCOPE.** This Annex defines the file formats and data elements used in ESC's XF7-CA program. Accompanying appendices include listings of data element files used with the XF7 file to generate the baseline.

3. **FILE DESCRIPTIONS.** ESC's baseline procedure is data-driven. Although the process is said to be "rule-based," the rule is based on explicitly coded data. There are essentially three file types in the system: general functional area (GFA), XF7 data element, and XF7 itself.

a. **General Functional Areas (GFA).** The basic purpose of the CA effort is to use valid XF7 positions to compile a CA profile. The GFA file defines all legitimate GFAs and sub-GFAs which can be used for such assignments. It merges definition data found in Army and Corps documents. The file also contains entries that define GFA category, supervisory induced changes, and a reporting alternative. (See Appendix A-1 for the file listing.)

(1) ***Category.*** GFA categories define which functions are governmental (not subject to CA study) and which are commercial (studiable). For an explanation of subcategories, see Engineer Regulation (ER) 5-1-3, Appendix B.

(2) ***Supervisory GFAs.*** ER 5-1-3 identifies several GFAs where some individuals might exercise governmental authority (C115 or C119). Since supervisory status seemed to be the best available means to identify such situations, ESC inserted a self-check in those few functions so that this status is checked and a more appropriate GFA subsequently assigned.

(3) ***Report Index.*** Considering the number of GFAs (in excess of 200), it was clearly desirable to create a more succinct, "executive" summary of the results. Force Configuration (FORCON) functions were chosen as the desirable vehicle since they were familiar and more manageable. In addition, Civil Works (DCW) asserted that FORCON had a more accurate view of Corps functions. By creating the FORCON format, ESC's Corps of Engineers Management Information System (COEMIS)-based profile could therefore be compared to both the Directorate of Resource Management's inventory and Civil Works' FORCON projections. **Figure A-1** shows the mapping.

FORCON FUNCTION	GFA'S INCLUDED IN FUNCTION
AM Administrative	All GFAs not explicitly assigned below
CO Construction	M001
DR Dredging	C108, C110, M021
EM Emergency	M026
EN Engineering	C120, C122, C123, C124, C125, C126, C128, M027
FC Flood Control	C100, C112
NA Natural Resource Mgmt	C106, C109, C114, S700
NV Navigation	C115, C116, C117
PL Planning	C121, M008
PU Power	C118
RE Real Estate	C200, C201, C202, C999, M003
RG Regulatory	C113
RS Research (R&D)	M006A
RV Revetment	C111
SP Support (R&D)	M006, R660
TC Tech	C119, C127, M002, M005, M028

Figure A-1. MAPPING OF GENERAL FUNCTION AREAS INTO FORCON FUNCTIONS[1]

b. **XF7 Data Element Files.** The following are brief descriptions of the data element files **(Figure A-2)** that ESC developed for GFA assignments. In each case, particular data elements have associated GFAs.

(1) ***First Level Organizations.*** First level organization codes **(Figure A-3)** are a component of the Corps of Engineers Management Information System for Personnel Administration (COEMIS PA) organization code. The first two characters of the code determine the division, district, Field Operating Activity (FOA), or special office. The third character is the first level organization code and is used to designate major organizational elements (e.g., counsel, public affairs, and planning.) Some elements may not have merely a

[1]Defined by DCW, May 1990.

Data Element	Start Loc	Length	Explanation
General Functional Area	1	5	4- or 5-character code for the functional areas identified in AR 5-20, ER 5-1-3, and DRM correspondence for all GFAs that apply to the Corps of Engineers.
CA Category	8	1	This code indicates whether a function should be subject to a CA analysis. There are 5 distinct categories: 0 - Stand alone 3 - Excepted 1 - Excluded 4 - Exempted 2 - Studiable Codes '0' and '1' are for GFAs that represent governmental functions that can't be done by contract. The other codes comprise commercial activities, but '3' and '4' indicate that conditions foreclose (perhaps only for several years) studies. (See ER 5-1-3, Appendix B for full explanation.)
Supervisory GFA	11	5	Some GFAs are split between governmental and non-governmental activities. Supervisory (i.e. decision making) status often distinguishes which applies. This is an optional entry; if a code is present, then this GFA may override the initial assignment if the position is deemed to be supervisory.
FORCON Index	17	2	To present the results in a more compact and familiar format, a report was designed that mapped the 200+ GFAs into the more succinct functional groups used in FORCON. The entries are FORCON indices* and are defined as: 1-admin 5-dredg 9-power 13-R E 2-plan 6-revet 10-natrs 14-Rsrch 3-engr 7-flood 11-emerg 15-RDspt 4-constr 8-regul 12-Navig 16-tech (*/ indices defined by Civil Works for DRM)
Title	21	40	Title of GFA

Figure A-2. FORMAT OF GENERAL FUNCTIONAL AREA ELEMENT FILE

single function. For that reason, the first level organization code is used as an assignment tactic only when other GFA assignment rules have failed. (See Appendix A-2 for the file listing.)

(2) ***Corps Stratification.*** Corps Stratification (**Figure A-4**) classified people by what they actually do rather than by position title.[2] An accurate functional breakout of this type would be a readily available source of CA-related data. Unfortunately, "Corps-Strat," is no longer sanctioned by the Corps, although a COEMIS field for it still remains. ESC examined the XF7 for reasonably accurate "Corps-Strat" codes and found they were the rule with few

[2]"Corps Stratification System," Information Paper from DAEN-RMU-P, 17 December 1981.

Data Element	Start Loc	Length	Explanation
First Level Organization	1	1	First level organization code as defined in EP 680-1-1, Appendix G.
General Functional Area	4	5	GFA associated with first level org.
Name	11	40	Title of first level organization.

Figure A-3. FORMAT OF FIRST LEVEL ORGANIZATION ELEMENT FILE

Data Element	Start Loc	Length	Explanation
Corps Stratification Code ("Corps Strat")	1	2	2-character "Corps Strat" code identified in EP 680-1-1.
General Functional Area	4	5	GFA associated with "Corps Strat" function.
Name	11	40	Title of the "Corps Strat" function.

Figure A-4. FORMAT OF CORPS STRATIFICATION ELEMENT FILE

exceptions.[3] Consequently, ESC mapped the "Corps-Strat" codes into GFAs. (See Appendix A-3 for the file listing.)

(3) ***Occupational Series.*** There are a substantial number of job series which can be associated with a single GFA almost exclusively. This file (**Figure A-5**) contains all the series listed on the XF7 versions that ESC received. During program execution, the only series actually retained are those with an associated GFA. Occupational series without GFAs indicate they have no strong correlation with a single GFA. Those series which can apply to more than one GFA must invoke rules associated with other data elements to resolve assignment. For example, lawyers can legitimately be in M009 (Counsel) or C200 (Real Estate Acquisition); accordingly, a single GFA cannot be nominated. (See Appendix A-4 for the file listing.)

(4) ***Organization Codes.*** The organization code data file (**Figure A-6**) has a dual purpose: first, it defines which organizations will be processed; second, it is an alternative means of assigning GFAs to any size organizational unit. The first purpose is useful in excluding organizations outside the CA purview (e.g., foreign FOAs such as the Far East and European Districts), and in identifying missing organizations from the XF7 file. The ability to assign GFAs revolves around using ORG-CODE "masks." There is no limit--other than the sheer number of existing ORG-CODEs--to the number of entries in this file. As an XF7 record is being processed, the ORG-CODE is checked against entries in this file to identify any matches through

[3]Several organizations had obviously stopped assigning "Corps-Strat" codes. The most notable was HQ USACE.

Data Element	Start Loc	Length	Explanation
Occupational series	1	6	The occupational series has two components: the first 2 characters are either "GS" for general schedule positions, or "WB" for blue collar jobs; the next 4 digits are the values actually used within the program.
General Functional Area	9	5	GFA associated with job series.
Name	16	30	Title of job series.

Figure A-5. FORMAT OF OCCUPATIONAL SERIES ELEMENT FILE

Data Element	Start Loc	Length	Explanation
Organization Code	1	8	COEMIS ORG CODE (see EP 680-1-1 Appendix G). A 2-character ORG CODE will be interpreted as a major organization (i.e. viewed as an FOA equivalent. An ORG CODE of 3 to 8 characters must have a GFA code (optional for 2-character ORG CODEs).
General Functional Area	11	5	GFA associated with this ORG CODE.
Name	21	30	Name of FOA-level organizations used in reports. (Not used for subordinate ORG CODES (3-8 character entries, but useful to annotate this file.)

Figure A-6. FORMAT OF ORGANIZATION CODE ELEMENT FILE

the last character of the "mask." If there is a match and it is not preempted by the match of a longer "mask," then the record is assigned the designated GFA. (See Appendix A-5 for the file listing.)

c. **COEMIS PA (XF7).** The data essential to ESC's method are extracted from the COEMIS PA. The Engineer Automation Support Activity creates the XF7 file monthly to capture the personnel status of the Corps. ESC did not need the entire XF7 file, especially the personal data portions. The extract produced for ESC contained all data items related to function and organization.

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APPENDIX A-1 TO ANNEX A

GENERAL FUNCTIONAL AREAS

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APPENDIX A-1 TO ANNEX A

GENERAL FUNCTIONAL AREAS

GENERAL FUNCTIONAL AREAS				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
C100	2		07	Opn & Maint of Flood Control Projects
C106	2		10	Opn of Recreational Areas
C106A	2		10	Controlling Entry Gate
C106B	2		10	Visitors Center Attendant
C106C	1		10	Law Enforcement
C106D	2		10	Potable & Wastewater Monitoring
C108	2		05	Opns of USACE Floating Plant
C109	2		10	Fish & Hatcheries
C110	2		05	Maint & Repair of USACE Floating Plant
C111	2		06	Bank Stabilization
C111A	2		06	Rip-Rap
C111B	2		06	Excavation & Grading for Mats
C111C	2		06	Mat Casting
C111D	2		06	Mat Loading
C111E	2		06	Mat Towing
C111F	2		06	Mat Sinking/Laying
C111G	2		06	Other Structures
C112	2	C112A	07	Opn & Maint of Dams
C112A	1		07	Gov't Function Portion of Dam Opns
C112B	2		07	Dam Opns
C112C	2		07	Routine Maint of Dams
C112D	2		07	Non-Routine Maint of Dams
C113	2		08	Studies Supporting Regulatory Functions
C113A	2		08	Aerial Photography/Remote Sensing
C113B	2		08	Navigability Studies
C114	2		10	Natural Resource Management
C114A	2		10	Fish Protection & Conservation
C114B	2		10	Wildlife Conservation & Management
C114C	2		10	Forest Management
C114D	2		10	Soils Management
C115	2	C115A	12	Opns & Maint of Locks & Bridges
C115A	1		12	Enforcement Actions at Locks (Critical Waterways)
C115B	2		12	Enforcement Actions at Locks (Non-Critical Waterways)

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
C115C	1		12	Opns of Locks on Critical Waterways
C115D	2		12	Opns of Locks on Non-Critical Waterways
C115E	2		12	Routine Maint at Locks on Critical Waterways
C115F	2		12	Routine Maint at Locks on Non-Critical Waterways
C115G	2		12	Emergency Repair of All Locks
C115H	2		12	Nonroutine Maint at All Locks
C115I	2		12	Opn & Maint of Bridges
C116	2		12	Opn & Maint (Open Water Navigation)
C116A	2		12	Drift & Debris Removal
C116B	2		12	Clearing & Snagging
C116C	2		12	Removal of Wrecks
C116D	2		12	Clearing & Repair of River Training & Contractual Work
C116E	2		12	Vessel Traffic Advisory
C116F	2		12	Others
C117	2		12	Opns & Maint of Jetties & Breakwaters
C118	2		09	Opns & Maint of Hydropower Facilities
C118A	1		09	Government Portion of Hydropower Opns
C118B	2		09	Other Hydropower Opns
C118C	2		09	Routine Maint of Critical Hydropower Facilities
C118D	2		09	Other Hydropower Maint
C119	2		16	Opn & Maint of the Washington Aqueduct
C119A	1		16	Treatment & Distribution
C119B	2		16	Other Opns & Maint
C120	3	M027	03	Designs, Plans, Specs, & Drawings (PLANS & SPECS)
C121	2	M027	02	Non A-E Professional Services
C122	3	M027	03	Tech Review of In-house & Contractor (TECH REVIEW)
C123	2	M027	03	Hydraulic & Hydrologic Field Investigations (H&H DATA)
C124	2	M027	03	Subsurface Exploration Services (DRILLING)
C125	2	M027	03	Surveying & Mapping Services (SURVEYING)

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
C125T	4		03	ETL's Terrain Analysis Center
C126	2	M027	01	Drafting Services (DRAFTING)
C127	2	M027	16	Laboratory Materials Testing Services (TESTING)
C128	2	M027	03	Other Professional A-E Service (OTHER A-E)
C200	2		13	Real Estate Acquisition
C201	2		13	Employee Relocation Assistance Program
C202	2		13	Real Estate Appraisal
C999	2		13	Other
H115	2		01	Clinics & Dispensaries
H117			01	Medical Records Transcription
H118			01	Nursing Services
H119			01	Preventive Maint
H120			01	Occupational Health
H121			01	Drug Rehabilitation
H999			01	Other Health Services
J507	2		01	Electronic & Communications Equipment
J999	2		01	Other Equipment
M001	1		04	Management of the Construction Division
M002	1		16	Management of the Opns Division
M003	1		13	Real Estate Division
M004	1		01	Resource Management/Comptroller
M005	1		16	Program Development
M006	1		14	Management of R&D
M007	1		01	Installation Services Management
M008	1		02	Planning
M009	0		01	Counsel/Legal
M010	1		01	Contracting
M011	1		01	Visual Information Management
M012	1		01	Education & Training Management
M013	1		01	Management of ADP Functions in IM
M014	1		01	Management of RPMA
M015	1		01	Public Affairs
M016	0		01	Management of Personnel & EEO
M017	0		01	Inspector General Management & Opns
M018	0		01	Internal Review & Audit Office

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
M019	0		01	Command Staff
M020	0		01	Safety & Occupational Health
M021	1		05	Dredging Management
M022	1		01	Studies Management
M023	1		01	WRSC Management
M024	1		01	Logistics Management
M025	0		01	Security & Law Enforcement
M026	0		11	Emergency Management
M027	1		03	Management of the Engineering Division
M028	1		16	Project Management
R660	2		01	RDT&E Support
S700	2		01	Natural Resource Services
S701	2		01	Advertising & Public Relations
S702	2		01	Financial & Payroll
S703	2		01	Debt Collection
S709	2		01	Custodial Services
S710	2		01	Pest Management
S712	2		01	Refuse Collection & Disposal Services
S713	2		01	Food Services
S714	2		01	Furniture
S715	2		01	Office Equipment
S716	2		01	Motor Vehicle Opn
S716A	2		01	Taxi Service
S716B	2		01	Bus Service
S716C	2		01	Motor Pool Opn
S716D	2		01	Crane Opn
S716E	2		01	Heavy Truck Opn
S716F	2		01	Construction Equip Opn
S716I	2		01	Driver or Operator Licensing or Training
S716J	2		01	Other Vehicle Opns
S716K	2		01	Fuel Truck Opns
S716M	2		01	Tow Truck Opns
S717	2		01	Motor Vehicle Maint
S717A	2		01	
S717C	2		01	
S717D	2		01	
S717E	2		01	

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
S717F	2		01	
S717G	2		01	
S717H	2		01	
S717I	2		01	
S717J	2		01	
S717K	2		01	
S717L	2		01	
S717M	2		01	
S718	2		01	Fire Prevention
S718A	2		01	
S718B	2		01	
S718C	2		01	
S718D	2		01	
S718E	2		01	
S718F	2		01	
S718G	2		01	
S718H	2		01	
S724	3		01	Guard Services
S724A	3		01	
S724B	3		01	
S724E	3		01	
S724S	3		01	
S725	2		01	Electrical Plants & Heating
S726	2		01	Heating Plants & Systems
S727	2		01	Water Plants & Systems
S728	2		01	Sewage & Waste Plants & Systems
S729	2		01	Air Conditioning & Refrigeration Plant
S730	2		01	Other Utilities
S732	2		01	Warehousing & Distribution of Publications
S999	2		01	Other Installation/FOA Services
T801	2		01	Storage & Warehousing
T801A	2		01	
T801B	2		01	
T801C	2		01	
T801D	2		01	
T801E	2		01	
T801F	2		01	

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
T801	2		01	
T801	2		01	
T801	2		01	
T805	2		01	Opn of Bulk Liquid Storage
T806	2		01	Printing & Reproduction
T807	2	M011	01	Visual Information Services
T807	2	M011	01	Still Photography
T807	2	M011	01	Motion Photography
T807	2	M011	01	Television
T807	2	M011	01	Audio
T807	2	M011	01	Graphic Art
T807	2	M011	01	Visual Information Libraries
T807	2	M011	01	Visual Information Technical Documentation
T807	2	M011	01	Visual Information Production
T807	2	M011	01	Visual Information Distribution
T807	2	M011	01	Visual Information Records
T809	2		01	Administrative Telephone Service
T810	2		01	Air Transportation Services
T811	2		01	Water Transportation Services
T811	2		01	
T811	2		01	
T816	4		01	Telecommunication Centers
T817	4		01	Other Communications & Electronics Systems
T819	2		01	Preparation & Disposal of Excess & Surplus
T820	2		01	Administrative Support Services
T820	2		01	Word Processing
T820	2		01	Reference & Technical Libraries
T820	2		01	Microfilming
T820	2		01	Internal Mail & Messenger Service
T820	2		01	Translation Services
T820	2		01	Publications Distribution Centers
T820	2		01	Field Printing & Publication
T820	2		01	Compliance Auditing
T820	2		01	Court Reporting
T999	2		01	Other Non-Manufacturing
U300	2		01	Specialized Skill Training
U500	2		01	Professional Development

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
U520			01	Graduate Education (Full Time)
U530			01	Other Full-Time Education Programs
U800			01	Training Development & Support
U999			01	Other Training Support Functions
W824	2		01	Data Processing Services
W824A	2		01	Opns of ADP Equipment
W824B	2		01	Production Control & Customer Services
W824C	2		01	ADP Magnetic Media Library
W824D	2		01	Data Transcription & Entry
W824E	2		01	Teleprocessing
W824F	2		01	Acceptance Testing & Recovery
W824G	2		01	Punch Card
W824H	2		01	Other ADP Opns & Support
W825	2		01	Maint of ADP Equip
W826	2		01	Systems Design, Development & Programming
W826A	2		01	Development & Maint of Applications
W826B	2		01	Development & Maint of Systems Software
W827	2		01	Software Services for Tactical Computers
W999	2		01	Other ADP Functions
X937	2		01	Logging & Lumber
X939	2		01	Construction Products
X999	2		01	Other Products
Z991	2		01	Family Housing
Z991A	2		01	Rehabilitation-Tenant Changes
Z991B	2		01	Roofing
Z991C	2		01	Glazing
Z991D	2		01	Tiling
Z991E	2		01	Exterior Painting
Z991F	2		01	Interior Painting
Z991G	2		01	Flooring
Z991H	2		01	Screens, Blinds, etc.
Z991I	2		01	Appliance Repair
Z991J	2		01	Electrical Repair
Z991K	2		01	Plumbing
Z991L	2		01	Heating Maint
Z991M	2		01	Air Conditioning Maint

GENERAL FUNCTIONAL AREAS (CONT'D)				
GFA Code	**CA Category**	**Supervisory GFA**	**FORCON Index**	**GFA Title**
Z991N	2		01	Emergency & Service Work
Z991T	2		01	Other Work
Z992	2		01	Family Housing
Z992A	2		01	Rehabilitation-Tenant Changes
Z992B	2		01	Roofing
Z992C	2		01	Glazing
Z992D	2		01	Tiling
Z992E	2		01	Exterior Painting
Z992F	2		01	Interior Painting
Z992G	2		01	Flooring
Z992H	2		01	Screens, Blinds, etc.
Z992I	2		01	Appliance Repair
Z992J	2		01	Electrical Repair
Z992K	2		01	Plumbing
Z992L	2		01	Heating Maint
Z992M	2		01	Air Conditioning Maint
Z992N	2		01	Emergency & Service Work
Z992T	2		01	Other Work
Z993	2		01	Grounds & Surface Areas
Z993A	2		01	Grounds (Improved)
Z993B	2		01	Grounds (Other Than Improved)
Z993C	2		01	Surfaced Areas
Z997	2		01	Railroad Facilities
Z998	2		01	Waterways & Waterfront Facilities
Z999	2		01	Other

LAST PAGE OF APPENDIX A-1 TO ANNEX A

APPENDIX A-2 TO ANNEX A

FIRST LEVEL ORGANIZATIONS

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APPENDIX A-2 TO ANNEX A

FIRST LEVEL ORGANIZATIONS

FIRST LEVEL ORGANIZATIONS		
ORG Code	**GFA**	**Organization**
0	M019	Executive Office
7	M007	Logistics
8	M018	Internal Review
B	M004	Office of Comptroller
C	M015	Public Affairs
D	M020	Safety
E	M009	Counsel
F	M012	Personnel
G	M011	Administrative Services
H	M005	Program Development
I	M013	Information Management
J	M013	ADP Office/Center
K	M008	Planning
L	M027	Engineering
M	M001	Construction-Operations
N	M003	Real Estate
P	M010	Contracting
Q	M001	Construction
R	M002	Operations
S	M017	Provost Marshal
Y	M018	Audit

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APPENDIX A-3 TO ANNEX A

CORPS STRATIFICATION CODE FILE

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APPENDIX A-3 TO ANNEX A

CORPS STRATIFICATION CODE FILE

CORPS STRATIFICATION CODE FILE		
GFA Code	**GFA**	**Stratification Code**
A1	M008	Planning and Reports ['A' = PLANNING]
A2	M008	Flood Plain/Urban Studies
A3	M008	Environment & Studies
B0	C120	Structural
B1	C122	Design/Technical ['B' = ENGINEERING] Engineering
B2	C120	Foundations & Materials
B3	C122	Hydraulics/Hydrology
B4	C123	Relocations
B5	C122	Estimating & Specifications
B6	C125	Survey
B7	C122	Electrical/Mechanical
B8	C128	General Engineering
B9	C126	Drafting and Mapping
K1	C125	Field Survey ['K' = FIELD ENGINEERING]
K2	C124	Testing/Exploration
K3	C128	Field General Engineering
P1	M010	Contract Admin ['P' = CONSTRUCTION]
P2	M001	Supervision & Inspection
L1	M001	Field Inspection ['L' = FIELD CONSTRUCTION]
L2	M028	Fields Contract Admin
C1	C112	Hydro-Power ['C' = OPERATIONS]
C2	M021	Navigation
C3	M002	Regulatory Functions
C4	C113	Resource Management
C5	M002	Plant & Maintenance
C6	M002	Misc. Operations
M1	C110	Floating Operations ['M' = FIELD OPERATIONS]
M2	C115	Locks & Dams
M3	C118	Field Power Operations
M4	C116	Field Plant & Maintenance
M5	C106	Field Resource Management
M6	C117	Misc. Field Operations
M7	C108	Dredging
M8	C113	Regulatory Functions
D1	C200	Acquisitions ['D' = REAL ESTATE]
D2	C202	Appraisals
D3	M003	Management & Disposal
D4	M003	Planning & Control

CORPS STRATIFICATION CODE FILE (CONT'D)		
GFA Code	**GFA**	**Stratification Code**
N1	C200	Acquisition ['N' = FIELD REAL ESTATE]
N2	C202	Appraisals
N3	M003	Management & Disposal
N4	M003	Planning & Control
E1	M004	Budget ['E' = Financial]
E2	S702	Finance & Accounting
E3	M018	Audit
E4	M004	Management Analysis
E5	M005	Program Development
F1	T820	Secretarial Typing ['F' = ADMIN SERVICES]
F2	T806	Reproduction
F3	T820	Mail & Records
F4	T820	General Services/Admin
F5	T820	Clerical
F6	T820B	Library
G1	M016	Recruiting and Placement ['G' = PERSONNEL]
G2	M016	Position & Pay Mgmt
G3	M016	Mgmt & Employee Relations
G4	M016	Technical Services
G5	M016	Manpower Management
G6	M012	Training
H1	W826	Systems & Programming ['H' = ADP]
H2	W824	Computer Operations
I1	M024	Procurement ['I' = PROCUREMENT & SUPPLY]
I2	M024	Supply
I3	M010	Contracts
I4	M024	GFE Procurement
J1	M009	Counsel ['J' = MISCELLANEOUS]
J2	M015	Public Affairs
J3	M020	Safety
J4	M025	Security/Provost Marshal
J5	M019	Executive Office
J6	U500	Trainees
J7	M016	EEO
J8	M017	Engineer IG
J9		DPCA
O1	T820	Field Secretarial/Typing ['O' = FIELD SUPPORT]
O2	S709	Field Admin Services
O3	S702	Field Financial
O4	M016	Field Personnel
O5	M024	Field Supply
O6	S999	Misc. Field Services
O7	U300	Field Trainees
O8	M007	Field Clerical

LAST PAGE OF APPENDIX A-3 TO ANNEX A

APPENDIX A-4 TO ANNEX A

OCCUPATIONAL SERIES FILE

APPENDIX A-4 TO ANNEX A

OCCUPATIONAL SERIES FILE

OCCUPATIONAL SERIES FILE		
Occupational Series	**GFA**	**Series Title**
GS0000		.
GS0001		.Trade Crafts
GS0008		.Installation Admin
GS0018	M020	.Safety and Occupational Health
GS0019	M020	.Safety Technician
GS0020	M008	.Community Planning
GS0021	M008	.Community Planning Technician
GS0023		.Outdoor Recreation Planning
GS0025	C106	.Park Ranger
GS0026		.
GS0028		.Environmental Protection Specialist
GS0029		.Environmental Protection Assistant
GS0080	M025	.Security Administration
GS0081		.Fire Protection and Prevention
GS0083	S724	.Police
GS0085	S724	.Security Guard
GS0086		.Security Clerical and Assistance
GS0090		.Guide
GS0099	M016	.General Student Trainee
GS0101		.Social Science
GS0102		.Social Science Aid & Technician
GS0110		.Economist
GS0119		.Economics Assistance Program Specialist
GS0123		.
GS0132		.Intelligence
GS0135		.Foreign Agricultural Affairs
GS0150		.Geography
GS0160		.Civil Rights Analysis
GS0170		.History
GS0180		.Psychology
GS0184		.Sociology
GS0190		.General Anthropology
GS0193		.Archeology
GS0199	M016	.Social Science Student Trainee
GS0201		.Personnel Management
GS0203		.Personnel Clerical and Assistance
GS0204		.Military Personnel Clerical and Technician

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS0205		.Military Personnel Management
GS0209		.
GS0212		.Personnel Staffing
GS0221		.Position Classification
GS0230		.Employee Relations
GS0233		.Labor Relations
GS0235		.Employee Development
GS0246		.Contractor Industrial Relations
GS0260		.Equal Employment Opportunity
GS0299		.
GS0300		.
GS0301		.Miscellaneous Administration and Program
GS0302		.Messenger
GS0303		.Miscellaneous Clerk and Assistant
GS0304		.Information Receptionist
GS0305		.Mail and File
GS0309		.Correspondence Clerk
GS0312		.Clerk-Stenographer and Reporter
GS0313		.Work Unit Supervising
GS0316		.
GS0318		.Secretary
GS0322		.Clerk Typist
GS0332	W824	.Computer Operation
GS0334	W826	.Computer Specialist
GS0335	W824	.Computer Clerk and Assistant
GS0340	M005	.Program Management
GS0341		.Administrative Officer
GS0342		.Support Services Administration
GS0343		.Management Analysis
GS0344		.Management Clerical and Assistance
GS0345		.Program Analysis
GS0346		.Logistics Management
GS0350		.Equipment Operator
GS0351		.Printing Clerical
GS0355		.Calculating Machine Operation
GS0356		.Data Transcriber
GS0357		.Coding
GS0361		.Equal Opportunity Assistance
GS0382		.Telephone Operating
GS0385		.Teletypist
GS0388		.Cryptographic Equipment Operations

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS0389		.Radio Operator
GS0391		.Communications Management
GS0392		.General Communications
GS0393		.Communications Specialist
GS0394		.Communications Clerical
GS0399	M016	.Admin and Office Support Student Trainee
GS0401		.General Biological Science
GS0403		.Microbiology
GS0404		.Biological Technician
GS0408		.Ecology
GS0410		.Zoology
GS0414		.Physiology
GS0430		.
GS0435		.Plant Physiology
GS0437		.Horticulture
GS0454		.Range Conservation
GS0457		.Soil Conservation
GS0460	C114C	.Forestry
GS0462	C114C	.Forestry Technician
GS0470	C114D	.Soil Science
GS0471		.Agronomy
GS0480	C114A	.Gen'l Fish and Wildlife Administration
GS0482	C114A	.Fishery Biology
GS0486		.Wildlife Biology
GS0499	M016	.Biological Science Student Trainee
GS0501		.Financial Administration and Program
GS0503		.Financial Clerical and Assistance
GS0505		.Financial Management
GS0510		.Accounting
GS0511		.Auditing
GS0520		.
GS0525		.Accounting Technician
GS0530		.Cash Processing
GS0540		.Voucher Examining
GS0544		.Payroll
GS0545		.Military Pay
GS0560		.Budget Analysis
GS0561		.Budget Clerical and Assistance
GS0590		.Time and Leave
GS0599	M016	.Financial Management Student Trainee
GS0602	H115	.Medical Officer

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS0610	H115	.Nurses
GS0640	H115	.Health Aid and Technician
GS0645	H115	.
GS0647	H115	.Diagnostic Radiologic Technologist
GS0679	H115	.Medical Clerk
GS0690	H115	.Industrial Hygiene
GS0699	M016	.Medical and Health Student Trainee
GS0749		.
GS0800		.
GS0801		.General Engineering
GS0802		.Engineering Technician
GS0803		.Safety Engineering
GS0804		.Fire Prevention Engineering
GS0806		.Materials Engineering
GS0807		.Landscape Architecture
GS0808		.Architecture
GS0809		.Construction Control
GS0810		.Civil Engineering
GS0817		.Surveying Technician
GS0818		.Engineering Drafting
GS0819		.Environmental Engineering
GS0828		.Construction Analyst
GS0830		.Mechanical Engineering
GS0850		.Electrical Engineering
GS0854		.Computer Engineering
GS0855		.Electronics Engineering
GS0856		.Electronic Technician
GS0861		.Aerospace Engineering
GS0865		.
GS0871		.Naval Architecture
GS0873		.Ship Surveying
GS0881		.Petroleum Engineering
GS0893		.Chemical Engineering
GS0895		.Industrial Engineering Technician
GS0896		.Industrial Engineering
GS0899		.Engr and Arch Student Trainee
GS0905		.General Attorney
GS0950		.Paralegal Specialist
GS0962		.Contact Representative
GS0963		.Legal Instruments Examining
GS0986		.Legal Clerk and Technician

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS1001		.General Arts and Information
GS1010		.Exhibits Specialist
GS1015		.Museum Curator
GS1016		.Museum Specialist and Technician
GS1020	T807E	.Illustrating
GS1021		.Office Drafting
GS1035	M015	.Public Affairs
GS1040		.Language Specialist
GS1046		.Language Clerical
GS1047		.Interpreter
GS1060	T807A	.Photography
GS1071	T807M	.Audio-Visual Production
GS1081		.
GS1082	T820	.Writing and Editing
GS1083	T820	.Technical Writing and Editing
GS1084	T807	.Visual Information
GS1087	T820	.Editorial Assistance
GS1099	U300	.Information and Arts Student Trainee
GS1101		.General Business and Industry
GS1102		.Contracting
GS1103		.Industrial Property Management
GS1104		.Property Disposal
GS1105		.Purchasing
GS1106		.Procurement Clerical and Assistance
GS1107		.Property Disposal Clerical and Assistance
GS1150		.Industrial Specialist
GS1152		.Production Control
GS1170		.Realty
GS1171		.Appraising and Assessing
GS1173		.Housing Management
GS1192		.
GS1199		.Business and Industry Student Trainee
GS1222		.Patent Attorney
GS1301		.General Physical Science
GS1310		.Physics
GS1311		.Physical Science Technician
GS1313		.Geophysics
GS1315		.Hydrology
GS1316		.Hydrologic Technician
GS1320		.Chemistry
GS1321		.Metallurgy

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS1340		.Meteorology
GS1341		.Meteorological Technician
GS1350		.Geology
GS1351		.
GS1360		.Oceanography
GS1361		.Navigational Information
GS1370	C125	.Cartography
GS1371	C125	.Cartographic Technician
GS1372	C125	.Geodesy
GS1373	C125	.Land Surveying
GS1374	C125	.Geodetic Technician
GS1399		.Physical Science Student Trainee
GS1410	T820	.Librarian
GS1411	T820	.Library Technician
GS1412	T820	.Technical Information Services
GS1420	T820	.Archivist
GS1515		.Operations Research
GS1520		.Mathematics
GS1521		.Mathematics Technician
GS1530		.Statistician
GS1531		.Statistical Assistant
GS1550		.Computer Science
GS1599		.Mathematics and Statistics Student Trainee
GS1601		.General Facilities and Equipment
GS1640		.Facility Management
GS1654		.Printing Management
GS1670		.Equipment Management
GS1701	M012	.General Education and Training
GS1702	M012	.Education and Training Technician
GS1710	M012	.Education and Vocational Training
GS1712	M012	.Training Instruction
GS1750	M012	.Instructional Systems
GS1801		.Gen'l Inspec., Investigation, and Compliance
GS1802		.Compliance Inspection and Support
GS1810		.General Investigating
GS1811		.Criminal Investigating
GS1910		.Quality Assurance
GS2001		.General Supply
GS2003		.Supply Program Management
GS2005		.Supply Clerical and Technician
GS2010		.Inventory Management

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
GS2030		.Dist Facilities and Storage Management
GS2101		.Transportation Management
GS2102		.Transportation Clerk and Assistant
GS2130		.Traffic Management
GS2131		.Freight Rate
GS2132		.Travel
GS2134		.Shipment Clerical and Assistance
GS2135		.Transportation Loss and Damage Claims
GS2144		.Cargo Scheduling
GS2150		.Transportation Operations
GS2151		.Dispatching
GS2161		.Marine Cargo
GS2181		.Aircraft Operation
GS7777		.
GW9322		.
WG2502		.Telephone Mechanic
WG2601		.
WG2604		.Electronics Mechanic
WG2606		.Electronic Industrial Controls Mechanic
WG2608		.Digital Computer Mechanic
WG2610		.Electronic Integrated Systems Mechanic
WG2801		.
WG2805		.Electrician
WG2810		.Electrician (High Voltage)
WG2854		.Electrical Equipment Repairing
WG3052		.
WG3302		.
WG3314		.Instrument Making
WG3359		.Instrument Mechanic
WG3414		.Machining
WG3416		.Toolmaking
WG3431		.Machine Tool Operating
WG3501		.
WG3502		.Laboring
WG3506		.Summer/Student Aid
WG3507	C108	.Deckhand Sailor
WG3508		.Pipeline Working
WG3511		.Laboratory Working
WG3515		.Laboratory Support Working
WG3566	S709	.Custodial Working
WG3603		.Masonry

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
WG3605		.Plastering
WG3606	Z992B	.Roofing
WG3610		.Insulating
WG3611		.Glazing
WG3653		.Asphalt Working
WG3701		.
WG3703		.Welding
WG3707		.Metalizing
WG3801		.
WG3802		.Forging Machine Operating
WG3806		.Sheet Metal Mechanic
WG3807		.Structural Ornamental Iron Working
WG3910	T807	.Motion Picture Production
WG4102	Z992	.? Painting
WG4104	Z992	.Sign Painting
WG4149		.
WG4202		.
WG4204		.Pipefitting
WG4206		.Plumbing
WG4401	T806	.Printing
WG4402	T806	.Bindery Working
WG4405	T806	.Film Assembly Stripping
WG4406	T806	.Letterpress Operating
WG4414	T806	.Offset Photography
WG4416	T806	.Platemaking
WG4417	T806	.Offset Press Operation
WG4419		.Silk Screen Making and Printing
WG4604		.Wood Working
WG4605		.Wood Crafting
WG4607		.Carpentry
WG4639		.Timber Working
WG4701		.? General Maintenance and Operation
WG4714		.Model Making
WG4715		.Exhibits Making/Modeling
WG4716		.Patternmaking
WG4737		.General Equipment Mechanic
WG4741		.General Equipment Mechanic
WG4742		.Utility Systems Repairing-Operating
WG4745		.Research Laboratory Mechanic
WG4749		.Maintenance Mechanic
WG4801		.? General Equipment Maintenance

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
WG5001		.? Plant and Animal Work
WG5003		.Gardening
WG5026	S710	.Pest Control
WG5210		.Rigging
WG5301		.? Industrial Equipment Maintenance
WG5306		.A/C Equipment Mechanic
WG5309		.Heating and Boiler Plant Equip Mechanic
WG5310		.Kitchen & Bakery Equip Repair
WG5318	C112	.Lock and Dam Repairing
WG5323	C108	.Oiling and Greasing
WG5324	C118	.Powerhouse Equipment Repairing
WG5326	C115	.Drawbridge Repairing
WG5334	C108	.Marine Machinery
WG5352		.Equipment Repairing
WG5378		.Powered Support Equip Mechanic
WG5401		.? Industrial Equipment Operation
WG5402	S726	.Boiler Plant Operation
WG5403		.Incinerator Operator
WG5406	S730	.Utility Systems Operator
WG5407	C118	.Electric Power Controlling
WG5408	S728	.Sewage Disposal Plant Operator
WG5409	S727	.Water Treatment Plant Operator
WG5415		.Air Conditioning Equip Operator
WG5423		.Sandblasting
WG5426	C112	.Lock and Dam Operating
WG5479	C108	.Dredging Equipment Operation
WG5686		.
WG5701	C108	.Fleet/Labor Foreman
WG5702		.Amphibian Truck Operation
WG5703	S716	.Motor Vehicle Operation
WG5704	C716	.Fork Lift Operating
WG5705	C716	.Tractor Operator
WG5716	C716	.Engineering Equipment Operating
WG5723	C108	.Boat Operating
WG5724	C108	.Ship Operating
WG5725	S716	.Crane Operating
WG5729	C124	.Drill Rig Operating
WG5734		.Wheel Operator
WG5738		.Railroad Maintenance Vehicle Operator

OCCUPATIONAL SERIES FILE (CONT'D)		
Occupational Series	**GFA**	**Series Title**
WG5782	C108	.Dredge Mates*
WG5784	C108	.Towboat Operations*
WG5786	C108	.Tender Operations*
WG5788	C108	.Deckhands*
WG5801		.? Transportation/Mobile Equip Maintenance
WG5803		.Heavy Mobil Equipment Mechanic
WG5806		.Mobile Equipment Servicing
WG5823	S717	.Automotive Mechanic
WG5901		.? Ammo, Explosives/Toxic Materials Work
WG6517		.Explosives Test Operator
WG6901		.
WG6904		.Tools and Parts Attending
WG6907		.Warehouse Working
WG6910		Materials Expediting
WG6912		.Material Sorting and Classifying
WG7002		.Packing
WG7304		.Laundry Working
WG7401		.
WG7402		.Baking
WG7404		.Cooking
WG7407		.Meatcutting
WG7408		.Food Service Working
WG7601		.
WG8318		.

LAST PAGE OF APPENDIX A4 TO ANNEX A

APPENDIX A-5 TO ANNEX A

ORGANIZATION CODES FILE

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APPENDIX A-5 TO ANNEX A

ORGANIZATION CODES FILE

ORGANIZATION CODES FILE		
Organization Code	**GFA**	**Organization**
#P6		Al Batin
G1		Alaska
M1		Albuquerque
E1		Baltimore
#Z		BERH
F1		Buffalo
Y0		CERC
U0		CERL
K2		Charlestown
F2		Chicago
T0		CRREL
ZD		Dept
F3		Detroit
Z1		EACA
X0		EASA
I0		ESC
V0		ETL
#J		Far East
W0		FESA
M2		Ft Worth
M3		Galveston
Z5		HEC
H1		Huntington
A0		Huntsville
K3		Jacksonville
#J		Japan
C1		Kansas City
M4		Little Rock
B0		LMVD
L1		Los Angeles
H2		Louisville
#P		MED
#P		MED Rear
B1		Memphis
B1502	C111	
B1MM503	C111	
B1MM504	C111	

ORGANIZATION CODES FILE (CONT'D)		
Organization Code	**GFA**	**Organization**
K5		Mobile
C0		MRD
L4		Mx Program
E0		NAD
H3		Nashville
F0		NCD
D0		NED
E3		New York
B2		New Orleans
E4		Norfolk
G0		NPD
Z0		OCE
C2		Omaha
H0		ORD
E5		Philadelphia
H4		Pittsburg
J0		POD
G2		Portland
#P		Riyadh
F4		Rock Island
L2		Sacramento
K0		SAD
L3		San Francisco
K6		Savannah
G3		Seattle
#E		Sinai
L0		SPD
F5		St Paul
B3		St Louis
M0		SWD
M5		Tulsa
N0		USAEDE
B4		Vicksburg
B4R506	C111D	
B4RR505	C111B	
G4		Walla Walla
R0		WES
K7		Wilmington
S0		WRSC
E1T	C119B	WASH Aqueduct nongfa

ORGANIZATION CODES FILE (CONT'D)		
Organization Code	**GFA**	**Organization**
E1T06	C119A	WASH Aqueduct
E1T07	C119A	WASH Aqueduct
V0V0F	C125T	ETL's TAC
S000	M023	WRSC EXEC
Z0	M019	.COE
Z0Q	M019	.Civil Works
Z0Q06	M008	.Planning
Z0Q09	M005	.Programs
Z0Q08	M002	.Ops & Read
*Z0Q01	M0	.Policy
*Z0Q02	M0	.Mgmt & Staff Spt
Z0M	M019	.Eng & Constr
Z0M05	M027	.Engr
Z0M04	M001	.Constr
*Z0M10	M0	.Mgmt Spt
Z0M12	M005	.Prog & Exec
Z0M09	M020	.Safety
Z0N	M003	.Real Estate
Z0B	M004	.DRM
*Z0B02	M0	.Budget
*Z0B08	M0	.Org & Productivity
*Z0B01	M0	.F&A
*Z0B06	M0	.Manpower
*Z0B10	M0	.Bus Practices
Z0W	M024	.Logistics
Z0J	M013	.Info Mgmt
Z0J0303	T820B	.Tech Library
Z0J0301	T807	.Visual Info
Z0F	M016	.Personnel
Z0E	M009	.Counsel
*Z0V	M0	.Small Bus
Z0D	M018	.Audit
Z0H	M015	.History
Z0J	M017	.Engr IG
Z0C	M015	.Public Affairs
Z0S	M025	.Security
Z0X	M016	.EEO
Z0P	M010	.Assist for Contract
Z0R	M006	.R&D
Z01	M019	.ACE

ORGANIZATION CODES FILE (CONT'D)		
Organization Code	**GFA**	**Organization**
P2LO2	M026	Emergency
P2I02	M026	Emergency
K0M0E	M026	Emergency
K2S	M026	Emergency
K5V	M026	Emergency
K6V	M026	Emergency
L0M03	M026	Emergency
L1M04	M026	Emergency
L2R	M026	Emergency
L3M06	M026	Emergency
B3RR3	M026	Emergency
B4RR3	M026	Emergency
M0M06	M026	Emergency
M2R21	M026	Emergency
M4M07	M026	Emergency
M51	M026	Emergency
H1R2A	M026	Emergency
H3R2A	M026	Emergency
H4R2A	M026	Emergency
F0A0	M026	Emergency
F1AS	M025	Emergency
F1A0	M026	Emergency
F4A0	M026	Emergency
G0QE	M026	Emergency
G1MN	M026	Emergency
G2RE	M026	Emergency
G3RE	M026	Emergency
D0R05	M026	Emergency
E0Q09	M026	Emergency
E1Q07	M026	Emergency
E3R13	M026	Emergency
E4M052	M025	Emergency
E5R011	M026	Emergency
C0M08	M026	Emergency
C2M	M026	Emergency
C1A	M026	Emergency
Z0Q0803	M026	Emergency

LAST PAGE OF APPENDIX A-5 TO ANNEX A

ANNEX B

THE XF7-CA PROGRAM

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ANNEX B

THE XF7-CA PROGRAM

1. **PURPOSE.** This Annex records the computer program that the Engineer Studies Center (ESC) used to accomplish the Commercial Activities (CA) Baseline Study.

2. **SCOPE.** The XF7-CA program was developed by ESC with a limited outlook. Though not insignificant in terms of effort to create, ESC did not envision the program's survival beyond completion of the Baseline Study. This Annex is therefore intended to document the procedures used to generate the alternative inventory, not to serve as information for future users.

3. **XF7-CA PROGRAM ARCHITECTURE.**

a. The XF7-CA program was written in SIMULA, a general purpose computer language available on a wide range of computers. SIMULA encourages a style referred to as object oriented programming (OOP). This style results in programs that depart from the form that FORTRAN or COBOL programmers might expect. OOP, when exploited, promotes problem decomposition and therefore better program structuring. It is particularly useful when developing prototype applications where there may be some uncertainty about the form and extent of the final product. That was clearly the situation confronting ESC as it attempted to construct a program that would convert the organizational and functional information on the XF7 into a framework that could serve as a CA inventory.

b. The program is fairly straight forward. First the General Functional Area, Corps Stratification, Occupational Series, First Level Organization, and Organizational Files are read and put into a tabular form to facilitate access.[1] The XF7 file is then processed using the logic described in the main paper and the data element table information in Annex A. (The program will identify a range of error situations and report those conditions.) The last step is the production of various reports, whose extent and type are defined by user input when first invoking the program.

4. **PROGRAM LISTING.** **Figure B-1** on the following pages depicts the Program Listing.

[1] The form adopted uses balanced binary trees, using the principal data element as the key.

```
%slength 80
begin
external class avltree;

avltree begin

ref(table) gstable, cstable, flotable;
ref(fnctns)  gfatable;     ref(gfa) testfnc,otry;
ref(outfile)logf,sumfyl;
ref(divdis)  foatable;     ref(foaorg) corps,dr,oorg,torg;
text        gfafyl, foafyl, xf7fyl, seriesfyl, flofyl, csfyl;
ref(infile) fgfa,   ffoa,   fxf7,   fgs,       fflo,   fcs;
text buf,foa,curorg,sfname;

   text orgcode,funcdes,occseries,grade,orgname,timebasis;
   text payplan,worksched,funclass,amscode,suposn,posocc,carprog;
   text cmdcode,faorg,corpstrat,paybase,fte,budelem,postitle;
   text foaportion;

boolean printab,rollupgfas,reportfoas,forconmap;
integer records,orgacc,orgrej;
nteger xsched,xpay,xfund,xcmd,xfnc,xorg,xposn;
ref(element) ftry;


! ==================== TABLE & ELEMENT ============================;

    root class table;
        begin
        ref(element) procedure find(t);text t;
            begin
            ref(element)s;integer i;
            s :- first;
            if s == none then
                 begin
                 find :- none;
                 outtext(title);outtext(" empty!");outimage;
                 end
                 else
                 while s =/= none do
                      if t < s.keycode then s :- s.ll
                           else
                           if t = s.keycode then
                                begin find :- s;s :- none; end
                                else
                                s :- s.rl;
            end;
        end * table *;


    node class element(keycode,title,fncarea);
        value keycode,title;text keycode,title;
        ref(gfa) fncarea;
        begin

        integer procedure test(s);ref(element) s;
            test := if keycode < s.keycode then -1 else
                        if keycode > s.keycode then 1 else 0;

        procedure dump;
            begin
            logf.outtext(" - - -  ");
            logf.outtext(keycode);logf.setpos(20);
            logf.outtext(title);logf.setpos(60);
            logf.outtext(fncarea.key);
            logf.outimage;
            end --dump--;

        end *element*;
```

Figure B-1. ESC'S XF7-CA PROGRAM

```
! ====================== FNCTNS & GFA ================================;

    root class fnctns;
        begin
        ref(gfa) procedure find(t);text t;
            begin
            ref(gfa)s;integer i;
            s :- first;
            if s == none then
                 begin
                 find :- none;
                 outtext(title);outtext(" empty!");outimage;
                 end
                 else
                 while s =/= none do
                      if t < s.key then s :- s.ll
                           else
                           if t = s.key then
                                begin find :- s;s :- none; end
                                else
                                s :- s.rl;
            end;

        procedure trace(org); ref(foaorg) org;
           begin
           if first =/= none then
              first qua gfa.thread(org)
              else
              begin outtext(" = = = GFA tree is empty!");outimage;end;
           end - retain -;
        end *fnctns*;

    node class gfa(key,supgfa,lable,forcode,cat);
        value key,supgfa,lable;text key,supgfa,lable;
        integer forcode,cat;
        begin
        integer milnum,civnum,miltot,civtot;ref(gfa)altgfa;

        integer procedure test(s);ref(gfa) s;
            test := if key < s.key then -1 else
                        if key > s.key then 1 else 0;
        procedure dump;
            begin
            inspect logf do
               begin
               outtext(key);setpos(6);outint(cat,4);
               setpos(12);outtext(" [");outtext(supgfa);outtext("] (");
               outint(forcode,2);outchar(')');
               setpos(24);outtext(lable);
               outimage;
               end;
            end --dump--;
        procedure thread(org); ref(foaorg) org;
           begin
           if ll =/= none then ll qua gfa.thread(org);
           if org.code = "CORPS" then
              org.tab(this gfa,civtot,miltot)
              else
              begin
              miltot := miltot + milnum; civtot := civtot + civnum;
              org.tab(this gfa,civnum,milnum);
              civnum := milnum := 0;
              end;
           if rl =/= none then rl qua gfa.thread(org);
           end - thread -;

           procedure prime(gtab); ref(fnctns)gtab;
              begin
              if ll =/= none then ll qua gfa.prime(gtab);
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
      if supgfa ne notext then
         begin
         altgfa :- gtab.find(supgfa);
         if altgfa == none then
            begin
            outtext("  >->->-> gfa substitution failure for ");
            outtext(key);outtext(" [");
            outtext(supgfa);outchar(']');
            outimage;
            end;
         end;
      if rl =/= none then rl qua gfa.prime(gtab);
      end - prime -;

   procedure plus(funding,supr); text funding,supr;
      begin
      if altgfa == none then
         begin
         if funding = "1" then milnum := milnum + 1
                          else civnum := civnum + 1;
         end
         else
         if validmngr(supr) then
            altgfa.plus(funding,"#")
            else
            if funding = "1" then milnum := milnum + 1
                             else civnum := civnum + 1;
      end - plus -;

   procedure dplus(nciv,nmil); integer nciv,nmil;
      begin
      civnum := civnum + nciv;  milnum := milnum + nmil;
      end - dplus -;
end *gfa*;



! ================== DIVDIS & FOAORG ============================;

    root class divdis;
        begin
        ref(foaorg) procedure find(t);text t;
            begin
            ref(foaorg)s;integer i;
            s :- first;
            if s == none then
                 begin
                 find :- none;
                 outtext(title);outtext(" empty!");outimage;
                 end
                 else
                 while s =/= none do
                      if t < s.code then s :- s.ll
                           else
                           if t = s.code then
                                begin find :- s;s :- none; end
                                else
                                s :- s.rl;
            end;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
        procedure results(sgfa); boolean sgfa;
            begin
            ref(foaorg) foa;
            foa :- first;
            if foa == none then
               begin
               outtext("There are no activities found in ");
               outtext(foa.title);outtext(" [");outtext(foa.code);
               outchar(']');outimage;
               end
               else
               foa.report(sgfa);
            end - results -;
        end *divdis*;

    link class activity(giaptr,civper,milper);
             ref(gfa)gfaptr; integer civper,milper; ;

    node class foaorg(code,title,orgfunc);
        value code,title;text code,title;
        ref(gfa) orgfunc;
        begin
        ref(head)profile,chart;
        integer array info(1:2,0:5);

        integer procedure test(s);ref(foaorg) s;
            test := if code < s.code then -1 else
                        if code > s.code then 1 else 0;

        procedure dump;
            begin  ref(foaorg) suborg;
            logf.outtext(code);logf.setpos(12);
            logf.outtext(title);
            logf.outimage;
            if not chart.empty then
               begin
               suborg :- chart.first;
               while suborg =/= none do
                  begin
                  logf.outtext("     ");
                  logf.outtext(suborg.code);logf.setpos(15);
                  logf.outtext(suborg.orgfunc.key);logf.setpos(25);
                  logf.outtext(suborg.title);logf.outimage;
                  suborg :- suborg.suc;
                  end;
               end;
            end --dump--;

        procedure tab(area,civ,mil);
           ref(gfa) area; integer civ,mil;
           new activity(area,civ,mil).into(profile);

         ref(gfa) procedure specfunc(ocode); text ocode;
         begin
         ref(foaorg) fo;
         integer mask,full;
         specfunc :- none;
         if not chart.empty then
            begin
            fo :- chart.first;
            while fo =/= none do
               begin
               mask := fo.code.length;
               if fo.code = ocode.sub(1,mask) then
                  begin
                  if mask > full then
                     begin full:=mask; specfunc:-fo.orgfunc; end;
                  end;
               fo :- fo.suc;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
            end;
         end;
      end - specfunc -;


procedure makediv(dtab,gtab); ref(divdis)dtab; ref(fnctns)gtab;
   begin  boolean notvoid;
   integer ix; text id; ref(foaorg)dcompo; ref(activity)dactv;
   ix := 1;
   while ix < code.length do
      begin
      id :- code.sub(ix,2);
      dcompo :- dtab.find(id);
      if dcompo == none then
         begin
         outtext("  >>>> division rollup vacancy ");
         outtext(id);
         outimage;
         end
         else
         begin
         dactv :- dcompo.profile.first;
         if dactv == none then
            begin
            outtext("  >>>> division rollup profile empty for ");
            outtext(id);
            outimage;
            end
            else
            begin
            notvoid := true;
            while dactv =/= none do
               begin
               dactv.gfaptr.dplus(dactv.civper,dactv.milper);
               dactv :- dactv.suc;
               end;
            end;
         end;
      ix := ix + 2;
      end;
   if notvoid then
      begin
      gtab.trace(this foaorg);
      report(true);
      end
      else
      begin
      outtext("    division rollup failure    ");
      outimage;
      end;
   end -- makediv --;


   procedure forcon;
       begin
       integer array fmat(1:2,0:16,0:4),cats(1:3);
       ref(activity)ax;          text fortitles;
       integer r,c,ic,ifn,fc;

       text procedure item(id); integer id;
          item :- fortitles.sub( 1+3*(id-1),3);

       procedure orow(ft,r);integer ft,r;
          begin
             cats(1) := fmat(ft,r,0)+fmat(ft,r,1);
             cats(2) := fmat(ft,r,2)+fmat(ft,r,3)+fmat(ft,r,4);
             cats(3) := cats(1) + cats(2);
```

Figure B-1. ESCS XF7-CA PROGRAM -- CONTINUED

```
        outint(cats(3),10);
        outint(fmat(ft,r,0),8);outint(fmat(ft,r,1),8);
        outint(cats(1),8);
        outint(fmat(ft,r,2),8);outint(fmat(ft,r,3),8);
        outint(fmat(ft,r,4),8);outint(cats(2),8);
    end;

fortitles :-
copy("ADMPLNENGCNTDRDRVTFC GRFPWRNRMEM NAVRE RSHSPTTEC");
ax :- profile.first;
if ax == none then
   begin
   outtext(" no activities for forcon mapping");
   outimage;
   end
   else
   begin
   while ax =/= none do
      begin
      ifn := ax.gfaptr.forcode;
      ic := ax.gfaptr.cat;
      fmat(1,ifn,ic) := fmat(1,ifn,ic) + ax.civper;
      fmat(2,ifn,ic) := fmat(2,ifn,ic) + ax.milper;
      ax :- ax.suc
      end;
   outimage;
   outtext("FORCON Mapping for ");outtext(title);
   outimage;
   for fc := 1,2 do
       begin
       if fc = 1 then
          outtext("Civil Funded Positions")
          else outtext("Military Funded Positions");
       outimage;outimage;
       outtext(" ITEM      TOTAL  STDALN   EXCLU   TOTGF   STUDY");
                        outtext("    XCEP    XEMP   TOTCA");
       outimage;OUTIMAGE;
       for r := 1,2,3,4 do
          begin
          outtext(item(r));outtext("   ");orow(fc,r);outimage;
          end;
       for r := 5 step 1 until 12 do
          for c := 0 step 1 until 4 do
             fmat(fc,0,c) := fmat(fc,0,c) + fmat(fc,r,c);
       outtext("OPS   ");orow(fc,0);outimage;
       for r := 5 step 1 until 12 do
          begin
          outtext("   ");outtext(item(r));orow(fc,r);outimage;
          end;
       outtext(item(13));outtext("   ");orow(fc,13);outimage;
       for c := 0 step 1 until 4 do
          fmat(fc,0,c) := fmat(fc,14,c) + fmat(fc,15,c);
       outtext("RD    ");orow(fc,0);outimage;
       outtext("   ");outtext(item(14));orow(fc,14);outimage;
       outtext("   ");outtext(item(15));orow(fc,15);outimage;
       outtext(item(16));outtext("   ");orow(fc,16);outimage;
       fmat(fc,0,0):=fmat(fc,0,1):=fmat(fc,0,2):=
                     fmat(fc,0,3):=fmat(fc,0,4):=0;
       for r := 1 step 1 until 16 do
           for c := 0 step 1 until 4 do
              fmat(fc,0,c) := fmat(fc,0,c) + fmat(fc,r,c);
       outtext(" TOTAL");orow(fc,0);outimage;
       outimage;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
            end;
         end;
      end - forcon -;

procedure report(sumgfa); boolean sumgfa;
   begin
   integer icat,fld,fw,i,j,osum;
   integer array sum(1:2,0:4);
   ref(activity) ax;      ref(gfa)curgfa;
   fw := 8;
   if ll =/= none then ll qua foaorg.report(sumgfa);
   ax :- profile.first;
   if ax == none then
     begin
     outtext(" --- No activity for [");
     outtext(code);outtext("] ");outtext(title);
     outimage;
     end
     else
     begin
     outimage;outtext("* * * * ");outtext(title);outimage;outimage;
     outtext("      G E N E R A L          ");
     outtext("         CIVIL FUNDED ACTIVITIES        ");
     outtext("        MILITARY FUNDED ACTIVITIES      ");
     outimage;
     outtext("  F U N C T I O N A L       ");
     outtext("|---Government--||---Commercial--------|");
     outtext("|---Government--||---Commercial--------|");
     outtext("   TOTAL");
     outimage;
     outtext("         A R E A S           ");
     outtext("  Stdaln   Exclu   Study   Excpt   Exmpt");
     outtext("  Stdaln   Exclu   Study   Excpt   Exmpt");
     outimage;
     while ax =/= none do
        if sumgfa then
           begin
           icat := ax.gfaptr.cat;
           if curgfa == none then
              begin
              curgfa :- ax.gfaptr;
              sum(1,icat) :=  ax.civper;
              sum(2,icat) :=  ax.milper;
              end
              else
              if curgfa.key.sub(1,4) = ax.gfaptr.key.sub(1,4) then
                 begin
                 sum(1,icat) := sum(1,icat) + ax.civper;
                 sum(2,icat) := sum(2,icat) + ax.milper;
                 end
                 else
                 begin
                 osum := 0;
                 outtext(curgfa.key);setpos(10);
                 outtext(curgfa.lable);setpos(30);
                 for i := 1,2 do for j := 0 step 1 until 4 do
                    begin
                    outint(sum(i,j),fw);  osum := osum + sum(i,j);
                    info(i,j) := info(i,j) + sum(i,j);
                    sum(i,j) := 0;
                    end;
                 outint(osum,fw);outimage;
                 sum(1,icat) := ax.civper;
                 sum(2,icat) := ax.milper;
                 curgfa :- ax.gfaptr;
                 end;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
            ax :- ax.suc;
            end
            else
            begin
            outtext(ax.gfaptr.key);setpos(10);
            outtext(ax.gfaptr.lable);
            icat := ax.gfaptr.cat;
            setpos(31 + fw * icat );
            outint(ax.civper,fw);setpos(pos + (4 * fw) );
            outint(ax.milper,fw);
            info(1,icat):=info(1,icat) + ax.civper;
            info(2,icat):=info(2,icat) + ax.milper;
            outimage;
            ax :- ax.suc;
            end;
        outimage;outtext("summary totals:     ");
        outtext(title);outimage;
        for i := 1,2 do
           for j := 0 step 1 until 4 do
              info(i,5) := info(i,5) + info(i,j);
        outimage;
        outtext("    CATEGORY           CIVIL           MILITARY       ");
        OUTIMAGE;
        outtext("----------------   -------------   -------------");
        outimage;
        outtext("Gov't Functions   ");
        outint(info(1,0),7);outint(info(2,0),14);outimage;
        outtext("  Excluded        ");
        outint(info(1,1),7);outint(info(2,1),14);outimage;
        outtext("Commercial Activ  ");
        outint(info(1,2),7);outint(info(2,2),14);outimage;
        outtext("  Exempted        ");
        outint(info(1,3),7);outint(info(2,3),14);outimage;
        outtext("  Excepted        ");
        outint(info(1,4),7);outint(info(2,4),14);outimage;
        outtext("Totals            ");
        outint(info(1,5),7);
        outfix(100*info(1,5)/(info(1,5)+info(2,5)),2,7);outchar('%');
        outint(info(2,5),6);
        outfix(100*info(2,5)/(info(1,5)+info(2,5)),2,7);outchar('%');
        outint((info(1,5)+info(2,5)),10);
        outimage;
        if forconmap then forcon;
        end;
     if rl =/= none then rl qua foaorg.report(sumgfa);
     end - report -;

procedure forplay;
   begin
   if ll =/= none then ll qua foaorg.forplay;
   forcon;
   if rl =/= none then rl qua foaorg.forplay;
   end -- forplay --;

procedure retain;
     begin  integer i,j;
     sumfyl.outtext(title.sub(1,5));
     for i := 1,2 do for j := 0,1,2,3,4,5 do
        sumfyl.outint(info(i,j),8);
     sumfyl.outimage;
     end - retain -;

  profile :- new head; chart :- new head;
  end *foaorg*;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
!   ================== PROCEDURES ==========================;

    boolean procedure validcmd(c); text c;
       validcmd := (c = "CE");

    boolean procedure validpay(p); text p;
       validpay := if ( (p = "PA") or (p = "PH") ) then true else false;

    boolean procedure validfunc(f); text f;
       validfunc := if (f = "1") or            ! mil $;
                       (f = "2") then true     ! civ $;
                       else false;

    boolean procedure validtime(t); text t;
       validtime := if findstr(t,"FGH") > 0 then true else false;

    integer procedure findstr(f,t); text f,t;
       begin
       integer s,e,i;
       s := f.length;
       e := t.length - s + 1;
       i := 1;
       while i <= e do
          if f = t.sub(i,s) then
             begin findstr := i; i := e + 1; end
             else
             i := i + 1;
       end;

    boolean procedure yesno(query);text query;
       begin character answer;
       outtext(query);outchar('?');outimage;
       inimage;
       answer := inchar;
       yesno := if (answer = 'Y') or (answer = 'y') then
         true else false;
       end + yesno +;


           boolean procedure validmngr(t); text t;
              validmngr := if findstr(t,"34") > 0 then true else false;



!   ***************** main program **************************;

    rollupgfas := true;
    logf :- sysout;

    outtext("Commercial Activities Analysis Program.");
    outimage;outimage;
    printab := yesno("Do you want tables printed");
    reportfoas := yesno("Do you want separate foas printed");
    forconmap := yesno("Do you want FORCON mappings for FOAs");
    buf :- blanks(150);

    outtext("Enter the name of the GFA file to be processed--");     ! GFA;
    outimage;inimage;gfafyl :- copy(intext(80).strip);

    gfatable :- new fnctns("FUNCTION AREA TABLE","  ");
    fgfa :- new infile(gfafyl);
    fgfa.open(buf);
    fgfa.inimage;
    while not fgfa.endfile do
```

Figure B-1. FSC'S XF7-CA PROGRAM -- CONTINUED

```
    begin
    if buf.sub(8,1) ne " " then
       new gfa(buf.sub(1,5).strip,
            buf.sub(11,5).strip,
            buf.sub(21,30).strip,
            buf.sub(17,2).getint,
            buf.sub(8,1).getint).rank(gfatable);
    fgfa.inimage;
    end;
gfatable.first qua gfa.prime(gfatable);
fgfa.close;
if printab then gfatable.traverse;

outtext("Enter the name of the occupational");
  outtext(" series file to be processed--");
outimage;inimage;seriesfyl :- copy(intext(80).strip);

gstable :- new table("Occup-Series TABLE","  ");              ! Occ-series;
fgs :- new infile(seriesfyl);
fgs.open(buf);
fgs.inimage;
while not fgs.endfile do
    begin
    testfnc :- gfatable.find(buf.sub(9,5).strip);
    if testfnc =/= none then
       new element(buf.sub(3,4),
                   buf.sub(16,30).strip,
                   testfnc).rank(gstable);
    fgs.inimage;
    end;
fgs.close;
if printab then gstable.traverse;

outtext("Enter the name of the CORPSTRAT");                    ! Corsp strat;
  outtext(" file to be processed--");
outimage;inimage;csfyl :- copy(intext(80).strip);

cstable :- new table("Corps Strat TABLE","  ");
fcs :- new infile(csfyl);
fcs.open(buf);
fcs.inimage;
while not fcs.endfile do
    begin
    testfnc :- gfatable.find(buf.sub(4,5).strip);
    if testfnc == none then
       begin
       outtext(" . . illegal GFA detected in ");
       outtext(buf.sub(1,40));outimage;
       end
       else
       new element(buf.sub(1,2),
                buf.sub(11,30).strip,
                testfnc).rank(cstable);
    fcs.inimage;
    end;
fcs.close;
if printab then cstable.traverse;

outtext("Enter the name of the first level org");              ! First lev;
  outtext(" file to be processed--");
outimage;inimage;flofyl :- copy(intext(80).strip);

flotable :- new table("First Level Org TABLE","  ");
fflo .- new infile(flofyl);
fflo.open(buf);
fflo.inimage;
while not fflo.endfile do
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
        begin
        testfnc :- gfatable.find(buf.sub(4,5).strip);
        if testfnc == none then
           begin
           outtext(" . . illegal GFA detected in ");
           outtext(buf.sub(1,40));outimage;
           end
           else
           new element(buf.sub(1,1),
                       buf.sub(11,30).strip,
                       testfnc).rank(flotable);
        fflo.inimage;
        end;
    fflo.close;
    if printab then flotable.traverse;

    outtext("Enter the name of the FOA titles file--");
    outimage;inimage;foafyl :- copy(intext(80).strip);

    foatable :- new divdis("FOA TABLE","  ");
    ffoa :- new infile(foafyl);
    ffoa.open(buf);
    ffoa.inimage;
    while not ffoa.endfile do
        begin
        if buf.sub(1,8).strip.length = 2 then
           new foaorg(buf.sub(1,2),
                      buf.sub(21,30).strip,
                      gfatable.find(buf.sub(11,5).strip))
                      .rank(foatable)
           else
           begin
           testfnc :- gfatable.find(buf.sub(11,5).strip);
           if testfnc == none then
              begin
              outtext(" . . missing/illegal GFA detected in ");
              outtext(buf.sub(1,40));outimage;
              end
              else
              begin
              torg :- foatable.find(buf.sub(1,2));
              if torg == none then
                 begin
                 outtext(" foa error - parent undefined for ");
                 outtext(buf.sub(1,40)); outimage;
                 end
                 else
                 new foaorg(buf.sub(1,8).strip,
                      buf.sub(21,30).strip,
                      testfnc).into(torg.chart);
              end;
           end;
        ffoa.inimage;
        end;
!   new foaorg("CORPS","USACE ROLLUP",none).rank(foatable);
    ffoa.close;
    if printab then foatable.traverse;

    outtext("Enter the name of the XF7 file to be processed--");
    outimage;inimage;xf7fyl :- copy(intext(80).strip);
    sfname :- copy(xf7fyl);   sfname.sub(1,2) := "xx";
    fxf7 :- new infile(xf7fyl);       sumfyl :- new outfile(sfname);
    fxf7.open(blanks(120));           sumfyl.open(blanks(132));

      orgcode  :- fxf7.image.sub(1,8);
      foaportion :- fxf7.image.sub(1,2);
      payplan  :- fxf7.image.sub(9,2);
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
   grade     :- fxf7.image.sub(11,2);
   funcdes   :- fxf7.image.sub(13,1);
   orgname   :- fxf7.image.sub(14,38);
   postitle  :- fxf7.image.sub(52,28);
   occseries:- fxf7.image.sub(80,4);
   funclass  :- fxf7.image.sub(84,2);
   amscode   :- fxf7.image.sub(86,12);
   suposn    :- fxf7.image.sub(98,1);
   posocc    :- fxf7.image.sub(99,1);
   timebasis:- fxf7.image.sub(100,1);
   worksched:- fxf7.image.sub(100,1);
   carprog   :- fxf7.image.sub(101,2);
   cmdcode   :- fxf7.image.sub(103,2);
   faorg     :- fxf7.image.sub(105,2);
   corpstrat:- fxf7.image.sub(107,2);
   paybase   :- fxf7.image.sub(109,2);
   fte       :- fxf7.image.sub(111,1);
   budelem   :- fxf7.image.sub(112,6);


fxf7.inimage;
while not fxf7.endfile do
    begin
    records := records + 1;
    if foaportion ne curorg then
       begin
       if oorg =/= none then gfatable.trace(oorg);
       curorg :- copy(foaportion);
       oorg :- foatable.find(curorg);
       if oorg =/= none then
          begin
          orgacc := orgacc + 1;
          outtext(" -- processing [");outtext(curorg);
          outtext("] - ");outtext(oorg.title);outimage;
          end
          else
          orgrej := orgrej + 1;
       end;
   if posocc ne " " then
   begin
    if oorg =/= none then
       begin
       if validcmd(cmdcode) then
        begin
        if validfunc(funcdes) then
         begin
         if validpay(paybase) then
          begin
          if validtime(worksched) then
           begin
           ftry :- gstable.find(occseries);
           if ftry =/= none then
              begin
              ftry.fncarea.plus(funcdes,suposn);
              end
              else
              begin
              otry :- oorg.specfunc(orgcode);
              if otry =/= none then
                 begin
                 otry.plus(funcdes,suposn);
                 end
                 else
                 begin
                 ftry :- cstable.find(corpstrat);
                 if ftry =/= none then
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
                        begin
                        ftry.fncarea.plus(funcdes,suposn);
                        end
                        else
                        begin
                        ftry :- flotable.find(orgcode.sub(3,1));
                        if ftry =/= none then
                           begin
                           ftry.fncarea.plus(funcdes,suposn);
                           end
                           else
                           begin
                           xfnc := xfnc + 1;
                           outtext(" ... Function assignment fault");
                           outtext(fxf7.image);outimage;
                           end - 1st lev -;
                        end - cs function -;
                     end - series - ;

                  end - org function -;
               end else xsched :=xsched +1;
            end else xpay:=xpay+1;;
         end else xfund:=xfund+1;
      end else xcmd:=xcmd+1;
   end else xorg:=xorg+1;
end else xposn := xposn + 1;

 fxf7.inimage;
 end;
if oorg =/= none then gfatable.trace(oorg);

corps :- new foaorg("CORPS","USACE ROLLUP",none);
gfatable.trace(corps);
corps.report(rollupgfas); corps.retain;
fxf7.close;

if reportfoas then foatable.results(rollupgfas)
   else if forconmap then foatable.first qua foaorg.forplay;

dr :- new foaorg("B0B1B9B2B3B4",
                 "LMVD - LOWER MISSISSIPPI VALLEY Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("C0C1C2","MRD  - MISSOURI RIVER Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
!  commented out for tests;
dr :- new foaorg("E0E1E3E4E5E7","NAD  - NORTH ATLANTIC Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("D0","NED  - NEW ENGLAND Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("F0F1F2F3F4F5","NCD  - NORTH CENTRAL Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("G0G1G2G3G4","NPD  - NORTH PACIFIC Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("H0H1H2H3H4","ORD  - OHIO RIVER Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("K0K2K3K5K6K7","SAD  - SOUTH ATLANTIC Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("L0L1L2L3L4","SPD  - SOUTH PACIFIC Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
dr :- new foaorg("M0M1M2M3M4M5","SWD  - SOUTH WEST Division",none);
   dr.makediv(foatable,gfatable);  dr.retain;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

```
sumfyl.close;
outimage;outtext("SUMMARY FILE STATISTICS:");outimage;outimage;
outtext("     records read    ");outint(records,10);outimage;
outtext("       vacancies     ");outint(xposn,10);outimage;
outtext("       org-rel rejs  ");outint(xorg,10);outimage;
outtext("       non CE        ");outint(xcmd,10);outimage;
outtext("       funding rejs  ");outint(xfund,10);outimage;
outtext("       pay rejs      ");outint(xpay,10);outimage;
outtext("       sched-rejs    ");outint(xsched,10);outimage;
outtext("       Assign-fails  ");outint(xfnc,10);outimage;
outtext("   Population Asgnd =");
outint( (records - (xposn+xorg+xcmd+xfund+xpay+xsched+xfnc) ),10);
outimage;
end;
end --program--;
```

Figure B-1. ESC'S XF7-CA PROGRAM -- CONTINUED

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LAST PAGE OF ANNEX B

ANNEX C

LIST OF ABBREVIATIONS AND ACRONYMS

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ANNEX C

LIST OF ABBREVIATIONS AND ACRONYMS

AR	Army Regulation
CA	Commercial Activities
COEMIS PA	Corps of Engineers Management Information System for Personnel Administration
CW	civil works
DCW	Directorate of Civil Works
DRM	Directorate of Resource Management
EASA	Engineer Automation Support Activity
ER	Engineer Regulation
ESC	Engineer Studies Center
FLO	First Level Organization
FOA	Field Operating Agency
FORCON	Force Configuration
FTE	full time equivalent
GFA	General Functional Area
OMB	Office of Management and Budget
OOP	object oriented programming
ORG-CODE	Organization Code
USACE	U.S. Army Corps of Engineers

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LAST PAGE OF ANNEX C

Engineer Studies Center	COMMERCIAL ACTIVITIES BASELINE STUDY	STUDY GIST CEESC-R-91-12

PRINCIPAL FINDINGS:

- ESC succeeded in developing an automated methodology which could classify Corps positions according to the general functional area taxonomy defined under the Commercial Activities (CA) Program. The resulting program (which used object oriented programming methods) provides a clear record of the data and logic used to classify positions.

- ESC's rule-based approach provides a clear audit trail from position to general functional area. Questions regarding functional totals can be quickly answered; changes to assignment criteria can be easily implemented.

- Commercial Activity inventories, using ESC's method, showed remarkably little change for years '86, '87, and '89.

- By automating the process, ESC can summarize CA results in a variety of ways to satisfy decision makers.

- The objectively based approach supports trans-organizational comparisons better than the current, highly subjective mode.

- Part of the confusion experienced in recent Corps CA inventory compilations was undoubtedly the result of the existing general functional area structure, which did not equitably discriminate among Corps' functions.

SCOPE OF THE STUDY: ESC developed a CA inventory methodology that could be used to compile an alternative baseline for comparison with the subjectively derived figures provided by Corps field organizations. This inventory methodology applies to both civil- and military-funded positions, and complies with requirements outlined in OMB Army and Corps CA regulations.

STUDY OBJECTIVE: ESC's purpose was to develop an objective means to categorize Corps' positions with respect to Commercial Activity functions. We then contrasted these estimates to initial and revised Corps' estimates to assess the consistency of present Corps' procedures.

BASIC APPROACH: ESC adopted a three-phased approach:

- First, we investigated available Corps databases to determine which, if any, could be used as the source data from which a CA inventory might be distilled. ESC ultimately chose the Corps' personnel database.

- Second, we confected a rule-based methodology from the personnel file and auxiliary files that were created to enable CA assignments.

- Third, ESC developed a computer program that uniformly applied the assignment rules and information to the personnel records and portrayed the resulting inventory according to guidelines laid down by the Deputy Chief of Engineers.

REASONS FOR PERFORMING THE STUDY: The Commercial Activities (CA) program, as promulgated in the Office Of Management and Budget's Circular, *A-76 Performance of Commercial Activities*, basically requires that services that can be more economically performed by the private sector should not be done by government employees. The U.S. Army Corps of Engineers (Corps) has been hailed as one of the government's most successful examples of compliance and cost reduction resulting from CA Studies. In the face of new OMB guidance, the Corps in 1990 found that its CA inventories had inexplicably changed, and that this might jeopardize future success.

THE STUDY SPONSOR: U.S. Army Corps of Engineers, Directorate of Resource Management.

PERFORMING ORGANIZATION AND PRINCIPAL AUTHOR: The U.S. Army Engineer Studies Center performed the study. The author of the report was Mr. Robert H. Halayko.

DTIC ACCESSION NUMBER: (not available)

COMMENTS AND SUGGESTIONS MAY BE SENT TO:

Director/Technical Director
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START AND COMPLETION DATES: Starting Date: November 1989
Completion Date: November 1990.